Amphibian and Reptile Surveys on and around the Ashland, Beartooth, and Sioux Districts of the Custer-Gallatin National Forest: 2002-2015

Prepared for:
Custer-Gallatin National Forest

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Montana Natural Heritage Program
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EXECUTIVE SUMMARY

Between 2002 and 2015, the Forest Service implemented a series of small contracts with the Montana Natural Heritage Program to conduct surveys for amphibians and reptiles with the overall objective of informing forest and project-level planning efforts on the Ashland, Sioux, and Beartooth Districts. The major goals of these efforts were to: (1) provide more widespread baseline survey coverage for amphibian and reptile species; (2) conduct visual encounter and dip net surveys of water bodies and wetlands to detect aquatic reptiles or breeding activity of amphibians; (3) conduct passive listening surveys for amphibian species that broadcast nocturnal breeding calls audible over long distances; (4) conduct visual encounter surveys for terrestrial reptiles in cliff, talus, and rock outcrop habitats; (5) record observations of all species detected incidentally while field crews were working in and around each management unit; and (6) integrate all information on structured surveys and detections of animal species into the data systems at the Montana Natural Heritage Program in order to make it readily available to natural resource management personnel at the Forest Service as well as the general public.

Using standardized protocols that have been used across Montana since the year 2000, we conducted 1,161 visual encounter and dip net surveys for amphibians and aquatic reptiles that breed in, or otherwise inhabit, standing water bodies or wetlands, 185 passive listening surveys for amphibian species that broadcast nocturnal breeding calls, and 91 visual encounter surveys for terrestrial reptiles that inhabit cliff, talus, and rock outcrop habitats.

Across units of the Ashland, Sioux, and Beartooth Districts surveys resulted in 807 detections of amphibians and aquatic reptiles at standing water bodies or wetlands, 142 detections of amphibians broadcasting nocturnal breeding calls, and 97 detections of terrestrial reptiles in cliff, talus, and rock outcrop habitats. In addition, we recorded 2056 detections of 178 species incidental to our formal surveys, including 122 detections of 16 Montana Species of Concern and 46 detections of 8 Forest Service Sensitive Species. All structured survey and detection information has been integrated into databases at the Montana Natural Heritage Program where it is available on the Montana Field Guide, Species Snapshot, and Map Viewer websites to inform resource management decisions.

Overall our surveys indicate that: (1) with the exception of the Pryor Mountains unit of the Beartooth District, amphibians and aquatic reptiles were widespread and relatively abundant at standing water bodies; (2) amphibian abundances were highest at standing water bodies on the Long Pines and North Cave Hills units of the Sioux District, apparently as a result of higher amounts of emergent vegetation and permanent water bodies associated with higher rainfall relative to areas to the west; (3) the Pryor Mountains unit of the Beartooth District was largely depauperate of amphibians, apparently due to the relatively high elevation of most standing water bodies and the limestone dominated geology that results in a lack of deep water habitats and very limited surface water connections to potential shallow water breeding sites present on Forest Service lands; (4) rock outcrops, particularly those at lower elevations, are important habitats for not only terrestrial reptiles, but also a number of bat and other species; (5) although Common Sagebrush Lizard (*Sceloporus graciosus)* was viewed as uncommon in the past these and other recent

surveys have found them to be widespread and common in lower elevation cliff, talus, and rock outcrop habitats across eastern Montana, resulting in their removal from the Montana Species of Concern list.

Based on the distribution and site occupancy rate information in this report, our observations while in the field, and the scientific literature, we recommend: (1) working with private land inholders to remove an isolated American Bullfrog population before they spread and do serious regional harm to native wildlife; (2) protect rock outcrop habitats from quarry development and invasion by exotic plant species; (3) continue to establish or reestablish beaver populations across the Forest in order to rewater dry watersheds; (4) ensure that every single cattle tank has climb out ramps that will allow wildlife that has fallen into the tank to climb out; and (5) assess the current status of wetlands that were red-flagged as having evidence for heavy structural impacts during our surveys.

While the baseline surveys summarized in this report go a long way towards assessing the true distribution and status of amphibians and reptiles on these Forest Service units, baseline surveys are still lacking or desirable on several units. In prioritized order, these are: (1) passive listening surveys for amphibian breeding choruses and visual encounter and dip net surveys of standing water bodies and wetlands for amphibians and aquatic reptiles on the Slim Buttes unit and unsurveyed areas of the North Cave Hills, South Cave Hills, East Short Pines, and West Short Pines; (2) passive listening surveys for amphibian breeding choruses on the Long Pines unit, especially for targeting the detection of Great Plains Toad; (3) rock outcrop surveys for reptiles in the North Cave Hills and southern aspects of the Pryor Mountains units.

Finally, we recommend an effort to educate U.S. Forest Service personnel and local members of the public on the identification of, and need to report observations for, amphibians and reptiles. This is likely the best way to accumulate incidental observations of rarely detected species that can be used to assess their distribution and status.

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INTRODUCTION

PROJECT NEED

The Forest Service is required by the National Forest Management Act to maintain a diversity of plant and animal species and accomplishes this, in part, through the enactment and revision of forest plans (NFMA 1976). The Custer Gallatin National Forest is currently initiating a forest plan revision. As part of this revision, the Forest Service must: (1) identify and assess available information for threated, endangered, proposed, and candidate species and potential species of conservation concern present in the plan area (36 CFR 219.6); and (2) select monitoring focal species that are indicators of ecological integrity and provide insights into the effects of management activities on composition, structure, function, and connectivity of ecological systems (FSH 1909.12).

There are 6 species of native amphibians and 14 species of native reptiles that are currently known to occur on or around the Pryor Mountains unit of the Beartooth District or on or around units of the Ashland and Sioux Districts of the Custer Gallatin National Forest; Western Tiger Salamander (*Ambystoma mavortium*), Great Plains Toad (*Anaxyrus cognatus*), Woodhouse's Toad (*Anaxyrus woodhousii*), Boreal Chorus Frog (*Pseudacris maculata*), Plains Spadefoot (*Spea bombifrons*), Northern Leopard Frog (*Lithobates pipiens*), Snapping Turtle (*Chelydra serpentina*), Painted Turtle (*Chrysemys picta*), Spiny Softshell (*Apalone spinifera*), Greater Short-horned Lizard (*Phrynosoma hernandesi*), Common Sagebrush Lizard (*Sceloporus graciosus*), Northern Rubber Boa (*Charina bottae*), North American Racer (*Coluber constrictor*), Plains Hog-nosed Snake (*Heterodon nasicus*), Western Milksnake (*Lampropeltis gentilis*), Gophersnake (*Pituophis catenifer*), Terrestrial Gartersnake (*Thamnophis elegans*), Plains Gartersnake (*Thamnophis radix),* Common Gartersnake (*Thamnophis sirtalis*), and Prairie Rattlesnake (*Crotalus viridis*) (Reichel 1995, Hendricks and Reichel 1996, Maxell 2000, Maxell et al. 2003, Atkinson and Atkinson 2004, Maxell 2004, Werner et al. 2004, Vitt et al. 2005, Maxell 2009, Hanauska-Brown et al. 2014, MTNHP 2016). As of September 2016, the Great Plains Toad, Plains Spadefoot, Northern Leopard Frog, Greater Short-horned Lizard, Milksnake, and Plains Hog-nosed Snake are all listed as Forest Service Sensitive Species (USFS 2011) and all but the Northern Leopard Frog are Montana Species of Concern (MTNHP & MTFWP 2016). In addition to these native species, the American Bullfrog (*Lithobates catesbeianus*), an exotic species native to the eastern half of the United States, has also been documented on a private land inholding of the Ashland District toward the upper reaches of the Stocker Branch of O'Dell Creek (Maxell 2004, Sepulveda et al. 2015, Kamath et al. 2016).

The three amphibian and three reptile species currently listed as Forest Service Sensitive across these units of the Custer Gallatin may become monitoring focal species under ongoing Forest Plan revisions in order to assess the health of the water bodies, wetlands, and rock outcrops on which they are dependent (FSH 1909.12).

OBJECTIVES

Given the relative lack of baseline information and the need to inform forest plan revisions and project-level planning efforts with basic information on the distribution and status of amphibian and reptile species, especially those classified as Sensitive, the Forest Service implemented a series of small contracts with the Montana Natural Heritage Program to conduct surveys for amphibian and reptile species on the Ashland, Sioux, and Beartooth Districts between 2009 and 2015. The major goals of these efforts were to: (1) provide more widespread baseline survey coverage for amphibian and reptile species; (2) conduct visual encounter and dip net surveys of water bodies and wetlands to detect aquatic reptiles or breeding activity of amphibians; (3) conduct passive listening surveys for amphibian species that broadcast nocturnal breeding calls audible over long distances; (4) conduct visual encounter surveys for terrestrial reptiles in cliff, talus, and rock outcrop habitats; (5) record observations of all species detected incidentally while field crews were working in and around each management unit; and (6) integrate all information on structured surveys and detections of animal species into the data systems at the Montana Natural Heritage Program in order to make it readily available to natural resource management personnel at the Forest Service as well as the general public.

METHODS

SURVEY TIMING

All field surveys for amphibians and reptiles summarized in this report were conducted between late April and late September when temperatures allowed these species to be active and more readily detectable by observers. The vast majority of visual encounter surveys of standing waters and rock outcrop surveys were conducted between mid-May and the first week of July. The majority of passive listening surveys for nocturnal calling amphibians were conduct between mid-May and mid-June during or immediately after periods of rainy weather.

VISUAL ENCOUNTER AND DIP NET SURVEYS OF STANDING WATERS

Site Mapping

Prior to field work, we mapped all potential standing water bodies in a geographic information system using digital topographic maps and National Agriculture Imagery Program aerial imagery (NAIP 2005, 2009, 2011, 2013).

Survey Methodology

All standing water bodies and wetlands previously identified on 1:24,000 scale topographic maps and NAIP imagery, or found incidentally, while in the field were surveyed when they were safely accessible and on public land or are on private lands where permissions were received for survey. Field crews used timed visual encounter and dip net surveys in all portions of the water bodies that were less than 50 cm in depth (Heyer et al. 1994, Olson et al. 1997, Maxell 2009). If little emergent vegetation was present, field crews carefully visually examined shallow water environments for the presence of eggs, larvae, or post metamorphic animals. However, in areas with dense emergent vegetation, they intensively sampled with repeated sweeps of the dip net. At sites where water depths dropped off steeply from the shoreline, visual searches and dip netting was performed from the shoreline. However, in areas with extensive shallows, field crews systematically searched and dip netted while wading through the area on evenly spaced transects.

Digital photographs of each site were taken from a vantage point that, where possible, allows the entire site to be seen in the context of surrounding habitats. Species identifications were made using the photographs and keys in Maxell et al. (2003) and Werner et al. (2004). Species detection and habitat information was recorded on a standardized datasheet (Appendix B).

Washing and Decontamination Procedures

In order to prevent the spread of fungal and viral pathogens, care was taken to wash mud, aquatic vegetation, and other materials off of dip nets, boots, socks, and other equipment prior to departing from a site. Survey gear was left to dry in the sun for as long as possible between sites. Dip nets, boots, socks, and other survey equipment were decontaminated with a mixture of 10% bleach (4 ounces or one half cup per gallon of water) between any sites where dead, dying, or ill animals were encountered, and between sites on different sides of divides separating major drainage basins. This was accomplished by washing gear in tubs or by simply spraying washed gear down with a pressurized sprayer containing 10% bleach and allowing it to dry in the sun.

PASSIVE LISTENING SURVEYS FOR NOCTURNAL CALLING AMPHIBIANS

We conducted nocturnal passive listening surveys for spring-breeding amphibians on nights during and after rainfall events between mid-May and mid-June when air temperatures were above 50 °F (10 °C) and wind and precipitation conditions were suitable for aurally detecting choruses of male amphibians broadcasting advertisement calls to females from potential breeding sites. Passive listening surveys involve slowly driving roads in the evening and night hours under weather conditions potentially presenting visual hazards. Therefore, we selected road routes to ensure the safety of surveyors and the ability of surveyors to detect calling amphibians. We avoided routes with high traffic volumes and listening stations with loud noises that would interfere with species detections.

Vehicles were stopped every mile or two of each survey route in low lying areas suitable for containing pooled water; GPS units assisted with locating stream crossings or water bodies most likely to contain suitable habitat. At each stop, surveyors passively listened for choruses of male amphibians for a minimum of 5 minutes without interference from vehicle or other noises before proceeding to the next stop. When choruses were detected, species identifications were verified using recordings in Davidson (1996) which are also posted on the Montana Field Guide at fieldguide.mt.gov. Surveyors estimated both the bearing of, using a compass, and the distance to all breeding choruses detected at each listening station. Survey route, listening station, breeding chorus, and other incidentally detected species information were all recorded on a standardized datasheet (Appendix C). The true location of breeding sites was subsequently identified in the office using listening station locations in combination with bearing and distance estimates and digital topographic maps and high resolution aerial photographs (NAIP 2005, 2009, 2011, 2013) in a geographic information system.

Although the Northern Leopard Frog was detected calling during some of our survey efforts, it should be noted that this species typically breeds soon after ice melts off ponds in mid- to late-March and its breeding calls are only audible over short distances even under the best of weather conditions. Thus, our passive listening surveys were not ideal for the detection of this species.

VISUAL ENCOUNTER SURVEYS OF CLIFF, TALUS, AND ROCK OUTCROPS

Site Mapping and Definition

Prior to field work, we mapped potential cliff, talus, and rock outcrop habitats in a geographic information system using National Agriculture Imagery Program aerial imagery (NAIP 2005, 2009, 2011, 2013). Not all potential sites identified were surveyed and numerous additional rock outcrop habitats were detected by survey crews in the field, but these preliminary mapping efforts were valuable in identifying local landscapes that were more likely to contain suitable habitat features. Areas targeted for survey were accessible on public land, had large areas of likely rock outcrop identified on aerial imagery, and had southern aspects. As time allowed, field crews attempted to survey up to four or more rock outcrops per quarter division of each 1:24:000 scale quadrangle map and individual sites were assigned names according to the quarter-quadrangle they occurred in (e.g., Birney_NE_1, Birney_NE_2, etc.).

Cliff, talus, and rock outcrop habitats of up to 400 x 400 square meters in size were targeted for survey as individual sites; larger features were broken into multiple survey locations smaller than 400 x 400 meters based on natural breaks such as a drainage or area with reduced amounts of cover objects. Landscapes with only scattered rock features were not targeted for full surveys in the manor described below, but surveyors were encouraged to quickly explore the most promising cracks and crevices or investigate cover rocks in these areas and a number of incidental observations of reptile species did result from these efforts.

Survey Methodology

Upon arriving at a rock outcrop site, surveyors coordinated with one another on likely survey routes in order to minimize overlap in area surveyed. Surveyors then used timed visual encounter surveys in all portions of the rock outcrop site. They slowly moved through survey areas, visually searching for basking reptiles and potential rock crevices and cover rocks at distances of up to 15-meters. Rock cracks and crevices detected were visually examined, with a headlamp if necessary, and were probed with a potato rake while listening and watching for animal movements. Where possible, cover-objects were lifted to reveal species hiding under them. In these cases, surveyors used a potato rake to lift the cover object and took care to keep the cover object between them and species potentially sheltering under the cover object in order to avoid being bitten by Prairie Rattlesnake, Northern Scorpion (*Paruroctonus boreus*) or venomous centipedes. Use potato rakes to probe rock crevices while listening and watching for animal movements. Use write-in-rain notebooks to note times at first detection and incidental observations of other animals.

Digital photographs of each site were taken from a vantage point that, where possible, allows the entire site to be seen in the context of surrounding habitats. Species identifications were made using the photographs and keys in Maxell et al. (2003) and Werner et al. (2004). Species detection and habitat information was recorded on a standardized datasheet (Appendix D).

STATISTICS

Proportions (p) and standard errors (SE) of proportions of standing water bodies, passive listening stations, and rock outcrop survey sites where species were detected were calculated as follows where n = number of sites surveyed and d = number of sites with detections:

$$p = {}^{d}\!/_{n}$$

$$\mathrm{SE} = \sqrt{\frac{(p(1-p)}{n}}$$

STORAGE & AVAILABILITY OF DATA

All amphibian and reptile survey information, site photographs, and locations of detections of animals during surveys or made incidentally are stored in databases at the Montana Natural Heritage Program in the Montana State Library in Helena and are made available online through the Montana Natural Heritage Program's Species Snapshot, Montana Field Guide, and MapViewer web applications so that it is integrated with other survey and incidental observation data and more readily available for forest and project-level planning efforts http://mtnhp.org

Results

SUMMARY OF SURVEY EFFORT

Dating back to the year 2000, we conducted 1,161 visual encounter and dip net surveys of sites potentially containing standing waters capable of supporting populations of amphibians and aquatic reptiles, 185 passive listening station surveys for amphibian species that broadcast nocturnal breeding calls, and 91 visual encounter surveys of rock outcrop habitats for terrestrial reptiles within boundaries of the Pryor Mountains and various units of the Ashland and Sioux Districts (Table 1).

Our efforts resulted in a near census of potential standing water bodies identified on topographic maps and aerial imagery on the Pryor Mountains, Ashland, Ekalaka Hills, Chalk Buttes, and Long Pines units (Figure 2). Only a small number of standing water bodies have been surveyed in the North Cave Hills unit and no standing water bodies have received baseline surveys on the Slim Buttes, East Short Pines, West Short Pines, or South Cave Hills units (Figure 2). Of the 1,161 potential water bodies that were surveyed, only 561 actually held standing waters capable of supporting amphibian reproduction or aquatic reptiles.

Our efforts provided solid baseline coverage for passive listening station surveys for amphibian species that broadcast nocturnal breeding calls on the Ashland District (Figure 3). All other units still lack baseline passive listening surveys for nocturnal calling amphibians (Figure 3). Lack of baseline surveys of this type are not problematic for detection of amphibian breeding activity on the Pryor Mountains, Chalk Buttes, and Ekalaka Hills units which are either largely dry, only have spring habitats with no standing waters, or, in the case of the Pryor Mountains, were depauperate of amphibian populations. However, it would be beneficial and relatively inexpensive to gather this baseline information for the Long Pines, Slim Buttes, East Short Pines, West Short Pines, South Cave Hills, and North Cave Hills. Furthermore, this methodology may be the least expensive way of monitoring the status of many amphibian populations over time.

Our efforts provided solid baseline coverage for rock outcrop surveys for reptile species on the Ashland District (Figure 4). All other units still lack baseline rock outcrop surveys (Figure 4). Lack of baseline surveys of this type are not problematic for detection of reptile populations on the Chalk Buttes, Ekalaka Hills, Long Pines, West Short Pines, East Short Pines, Slim Buttes, and South Cave Hills which generally lack rock outcrops with significant interstitial spaces or cracks and crevices. However, beneficial to conduct these surveys on the Pryor Mountains unit, especially on the south side of the unit that has greater amounts of solar exposure.

SUMMARY OF SPECIES DETECTIONS

Across units of the Ashland, Sioux, and Beartooth Districts surveys resulted in 807 detections of amphibians and aquatic reptiles at standing water bodies or wetlands, 142 detections of amphibians broadcasting nocturnal breeding calls, and 97 detections of terrestrial reptiles in cliff, talus, and rock outcrop habitats. In addition, we recorded 2056 detections of 178 species incidental to our formal surveys, including 122 detections of 16 Montana Species of Concern and 46 detections of 8 Forest Service Sensitive species (Table 5).

The Pryor Mountains unit was essentially depauperate of amphibian species with only the Western Tiger Salamander detected breeding at the same site on the south side of the unit during both the 2005 and 2013 surveys (Figure 5, Table 2). With the exception of Terrestrial Gartersnake, much of the Pryor Mountains unit was also devoid of reptiles (Figures 12-25). However, given the habitats that are available, it seems likely that Greater Short-horned Lizard, Common Sagebrush Lizard, Northern Rubber Boa, North American Racer, Western Milksnake, Gophersnake, and Prairie Rattlesnake are probably much more widely distributed and common on lower elevation Forest Service lands in the Pryor Mountains unit than is currently documented.

With the exception of a few species, the Ashland District is definitely home to the most diverse and abundant populations of amphibians and reptiles (Figures 5-25, Tables 2-4).

Portions of the Sioux District are still too undersurveyed to put the status of their amphibian and reptile populations in a regional perspective. However, there seemed to be an obvious trend of Northern Leopard Frog populations being more widespread and common, on the Long Pines and North Cave Hills units where they were detected at 60 to 90 percent of standing water bodies relative to the Ashland District where they were consistently detected at around 11 to 15 percent of standing water bodies (Figure 11, Table 2). In addition to being more widespread and common in the Long Pines and North Cave Hills units, Northern Leopard Frog populations in this region were also much more abundant at individual sites relative to units to the west.

Amphibian species that were common and widespread included: Western Tiger Salamander which was detected at nearly 40 percent of standing water bodies surveyed on the Ashland District in 2004 and 2005 (Figure 5, Table 2); Woodhouse's Toad which was detected at around 40 to 50 percent of standing water bodies on the Ashland District in 2002, 2004, and 2005 (Figure 7, Tables 2 and 3); Boreal Chorus Frog which was detected at 30 to 35 percent of standing water bodies on the Ashland District in 2002, 2004, and 2005 (Figure 7, Tables 2 and 3); Painted Turtle which was detected at 14 to 20 percent of sites on the Ashland District in 2002, 2004, and 2005 and at 35 percent of sites on the Long Pines unit in 2012 (Figure 13, Table 2); North American Racer which was detected at 24 to 36 percent of rock outcrops surveyed on the Ashland District in 2005 and 2008 (Figure 18, Table 4); Gophersnake which was detected infrequently during our survey efforts, but was encountered commonly while traveling by foot or vehicle between survey sites across all survey years (Figure 21, Table 4); and Prairie Rattlesnake which was detected at 24 and 40 percent of rock outcrops surveyed on the Ashland District in 2005 and 2008, respectively (Figure 25, Table 4).

Species that appear to be less common and/or widespread include: Great Plains Toad although it was detected at 34 percent of passive listening stations surveyed on the Ashland District in 2010 (Figure 6, Tables 2 and 3); Snapping Turtle which is only present on Forest Service lands that intersect major valleys (Figure 12); Greater Short-horned Lizard which has only been detected a handful of times on individual units (Figure 15); Northern Rubber Boa, which has not yet been detected, but is likely to occur on both the Pryor Mountains and Ashland units (Figure 17); Plains Hog-nosed Snake which was only infrequently encountered incidental to our survey efforts (Figure 19); Western Milksnake which was only detected at 5 to 6 percent of rock outcrop surveys (Figure 20, Table 4)

Range boundaries, potentially facilitated by environmental superiority or competitive interactions were evident in the three gartersnake species inhabiting the region (Figures 22-24). The Terrestrial Gartersnake was the only species detected in the Pryor Mountains unit and was the species most commonly encountered incidentally during our survey efforts on the Ashland Distict. However, this species gave way to the Plains Gartersnake on units of the Sioux District where it was detected at 10 to 14 percent of sites surveyed on the Long Pines unit in 2010 and 2012 and 44 percent of sites surveyed on the North Cave Hills unit in 2015. The Common Gartersnake was rarely encountered across the entire region and most records were limited to river valleys (Figure 24).

Perhaps the species detection of greatest conservation concern was that of the exotic American Bullfrog which was detected in a series of reservoirs and beaver ponds on a private land inholding on the upper Stocker Branch of O'Dell Creek (Figure 10). American Bullfrogs are known to have had dramatic impacts on native wildlife where they have been introduced around the globe (Bury and Whelan 1984).

From a conservation status ranking perspective, Plains Spadefoot's state rank of S2 (MTNHP and FWP 2016) may need to be reconsidered given how commonly the species was detected during calling survey efforts in 2010 (Figure 9, Table 3). However, most of the breeding effort was on private lands in major valleys and the species was very rarely detected breeding in standing waters on Forest Service Lands (Figure 9, Table 2). As a result of rock outcrop surveys in 2005-2010 across central and eastern Montana, including those on the Ashland District in 2005 and 2008 where it was detected at 64 percent of the rock outcrops surveyed, the Common Sagebrush Lizard was removed from the Montana Species of Concern list (Figure 16, Table 4, Hanauska-Brown et al. 2014, MTNHP and MFWP 2016).

All structured survey and detection information included in this report has been integrated into databases at the Montana Natural Heritage Program where it is available on the Montana Field Guide, Species Snapshot, and Map Viewer websites to inform resource management decisions.

Management Recommendations

Based on the distribution and site occupancy rate information in this report, our observations while in the field, and the scientific literature, we recommend the following management actions:

1) Work with owners of the private land inholding on the upper Stocker Branch of O'Dell Creek to eliminate American Bullfrog populations as soon as possible before they spread to waters on Forest Service lands, the Tongue River watershed, or other adjacent areas of southeastern Montana where they could do serious harm to native wildlife populations (Bury and Whelan 1984). This could be accomplished by waiting until after the first freezes in early winter and then draining the serious of reservoirs and beaver ponds that they currently inhabit. Allowing these sites to fully freeze and dry for an entire winter should be followed up with surveys the next summer before reservoirs are re-established.

2) Our surveys of rock outcrops indicated that these are important habitat for a great diversity of wildlife, including reptiles, bats, small terrestrial mammals, and birds. Protecting rock outcrops, particularly those with cracks and crevices or interstial spaces between rock layers is important for maintaining healthy habitat for these species. Threats to these sites include quarry development and the choking out of interstitial spaces and basking habitat by exotic species such as Cheatgrass (*Bromus tectorum*), Japanese Brome (*Bromus japonicus*) and Yellow Sweetclover (*Melilotus officinalis*).

3) Continue to establish or reestablish beaver populations across the Forest in order to rewater dry watersheds and provide better connectivity between isolated populations of amphibians and other species that are dependent on surface waters.   populations dependent on surface waters for travel (Funk et al. 2005, Amish 2006).

4) Large numbers of cattle tanks, especially across the Ashland District, were found to have dead raptors, passerine birds, and bats that had become trapped in the tank and drowned. Many of these tanks did not have climb out ramps. An effort needs to be made to ensure that every single cattle tank has climb out ramps that will allow wildlife that has fallen into the tank to climb out (see Taylor and Tuttle 2007).

5) Assess the current status of wetlands that were red-flagged as having evidence for heavy structural impacts in order to ensure that they do not become permanently impaired. Red-flagged wetland locations and site photos can be accessed online under the Georeferenced Photots task of the Map Viewer web application http://mtnhp.org/mapviewer/?t=5

Future Survey Recommendations

With minor exceptions, baseline surveys for both terrestrial and aquatic amphibians and reptiles are now generally adequate on the Ashland, Ekalaka Hills, and Long Pines units (Figures 2-4). Furthermore, with minor exceptions, additional surveys of rock outcrops are probably unwarranted due to adequate baseline surveys or a general lack of rocky habitats with interstial spaces that could support reptile populations.

Baseline surveys are still lacking or desirable on several units. In prioritized order, these are:

1) Passive listening surveys for amphibian breeding choruses and visual encounter and dip net surveys of standing water bodies and wetlands for amphibians and aquatic reptiles on the Slim Buttes unit and unsurveyed areas of the North Cave Hills, South Cave Hills, East Short Pines, and West Short Pines.

2) Passive listening surveys for amphibian breeding choruses on the Long Pines unit, especially for targeting the detection of Great Plains Toad.

3) Rock outcrop surveys for reptiles in the North Cave Hills and southern aspects of the Pryor Mountains units.

In addition to these baseline surveys, we recommend that a combination of passive listening surveys for nocturnal calling amphibians, visual encounter and dip net surveys for amphibians and aquatic reptiles at standing water bodies and wetlands, and visual encounter surveys for reptiles at rock outcrops be repeated at 10 to 15 year intervals in order to reassess the conservation status of these species and populations over time in the context of land management assessment and planning efforts. Passive listening surveys for nocturnal calling amphibians coupled with resurveys of a small subset of standing water bodies and rock outcrops is likely the most affordable approach to future status assessments.

Finally, because Snapping Turtle, Greater Short-horned Lizard, Northern Rubber Boa, Plains Hog-nosed Snake, and Milksnake all have low detection probabilities, we believe an educational effort for U.S. Forest Service personnel and local members of the public is likely the best way to accumulate incidental observations of these species that can be used to assess their distribution and status.

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Figure 1. Administrative units on the Beartooth, Ashland, and Sioux Districts of the Custer Gallatin National Forest in the region where surveys were conducted.

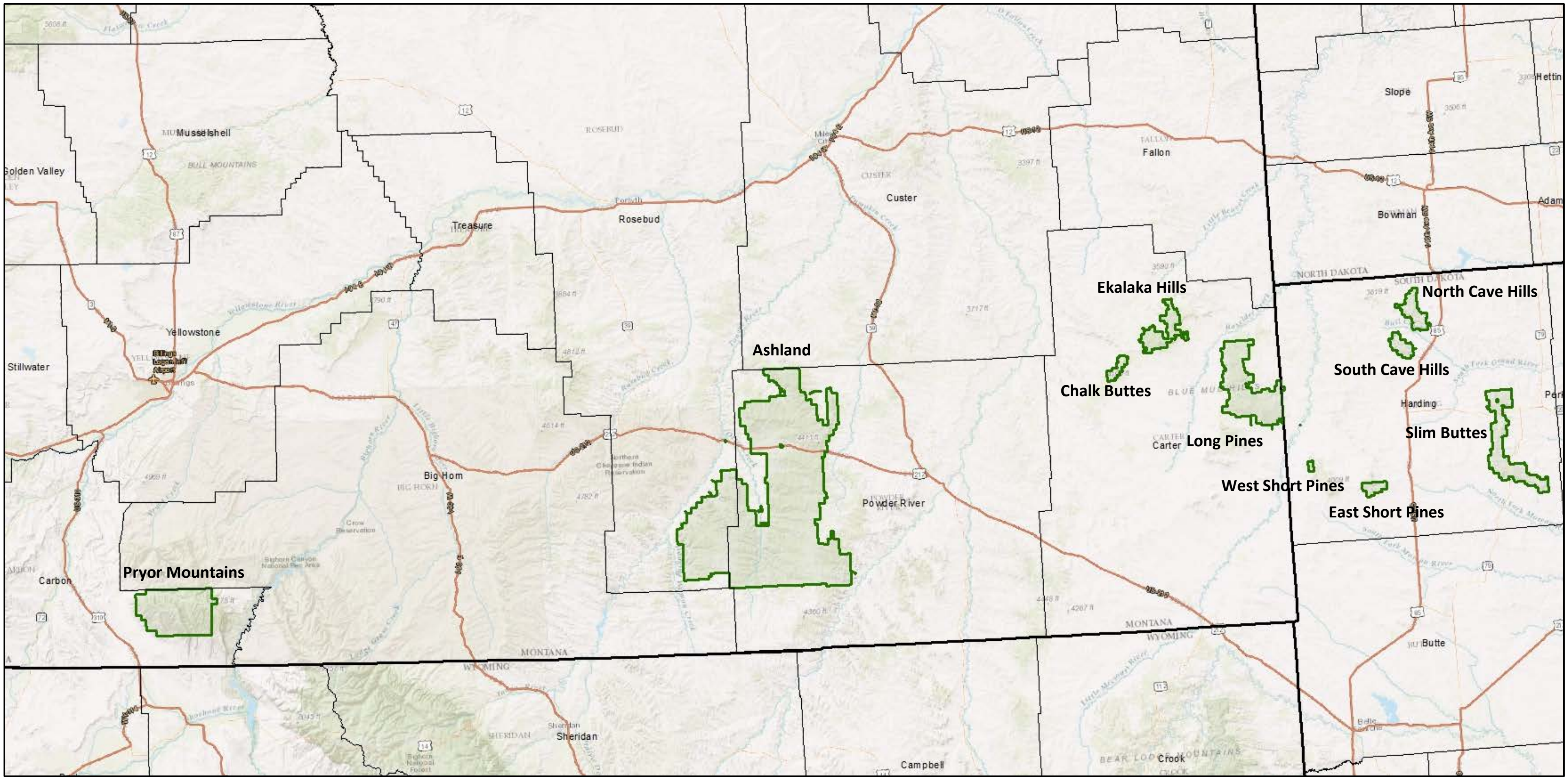

Figure 2. Regional overview of visual encounter and dip net surveys for amphibians and aquatic reptiles at standing water bodies and wetlands (black dots). Custer Gallatin National Forest Units are outlined in green.

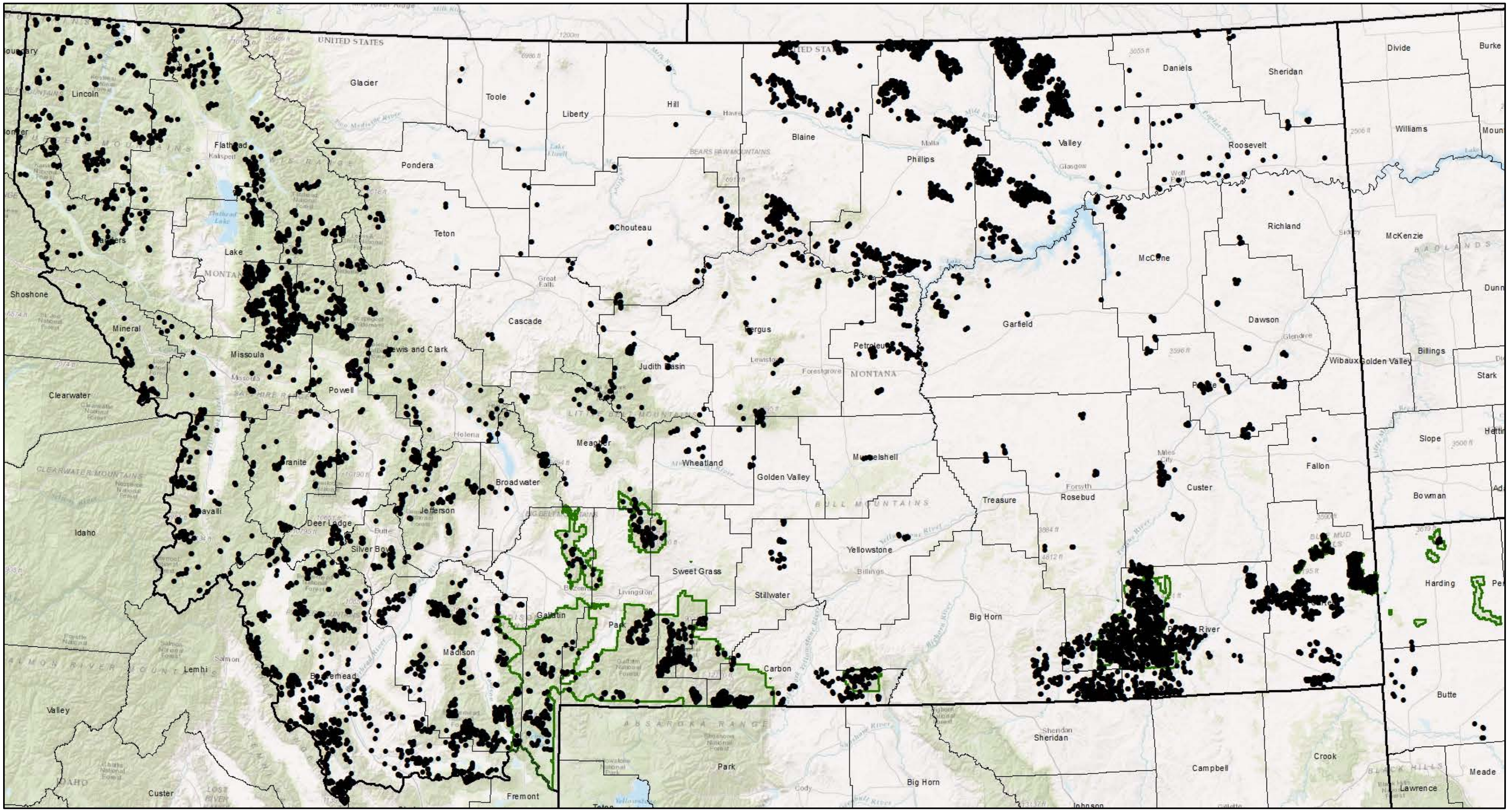

Figure 3. Regional overview of passive listening surveys for nocturnal calling amphibians (black dots). Custer Gallatin National Forest Units are outlined in green.

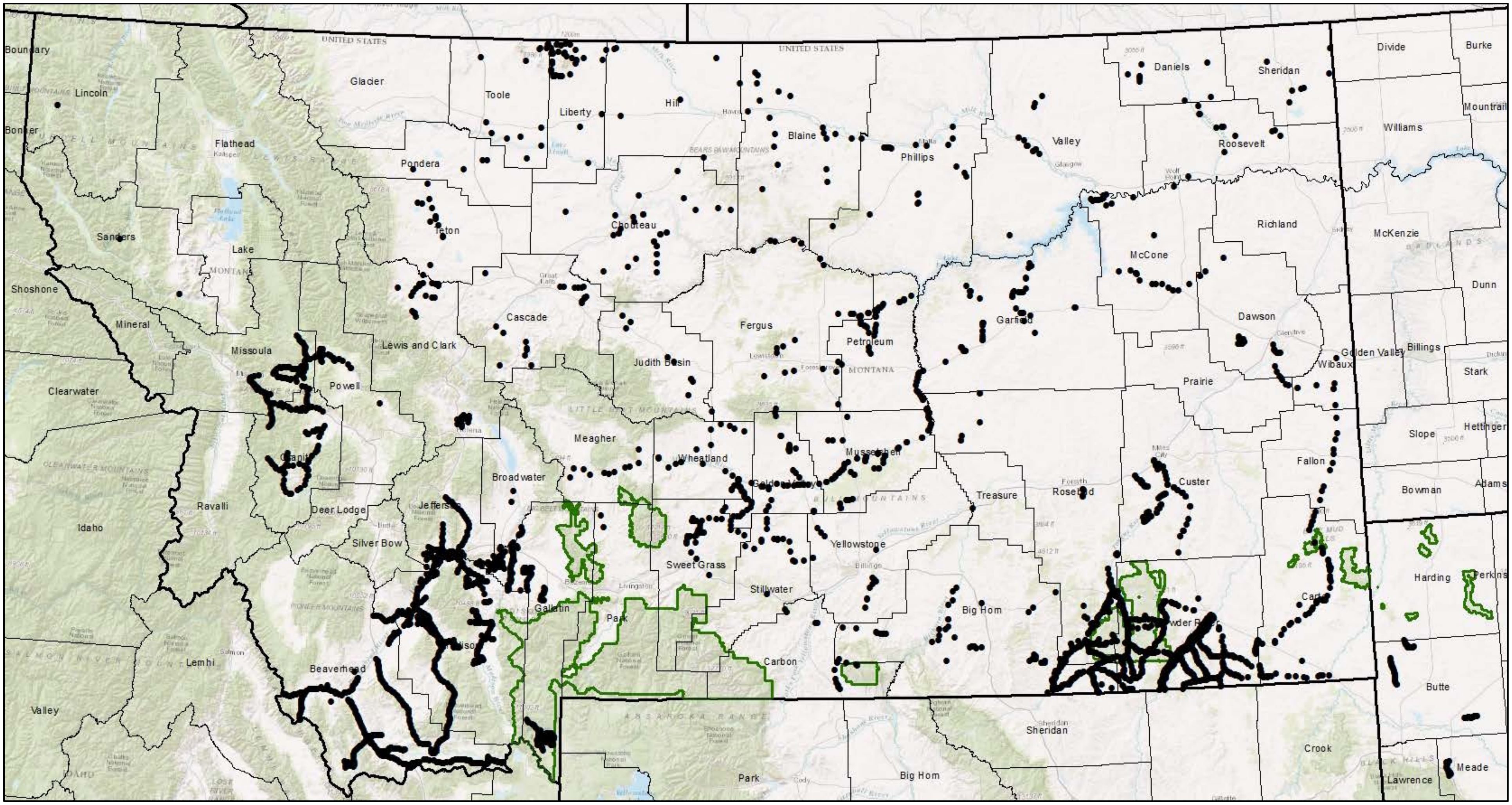

Figure 4. Regional overview of visual encounter surveys for terrestrial reptiles at cliff, talus, and rock outcrop habitats (black dots). Custer Gallatin National Forest Units are outlined in green.

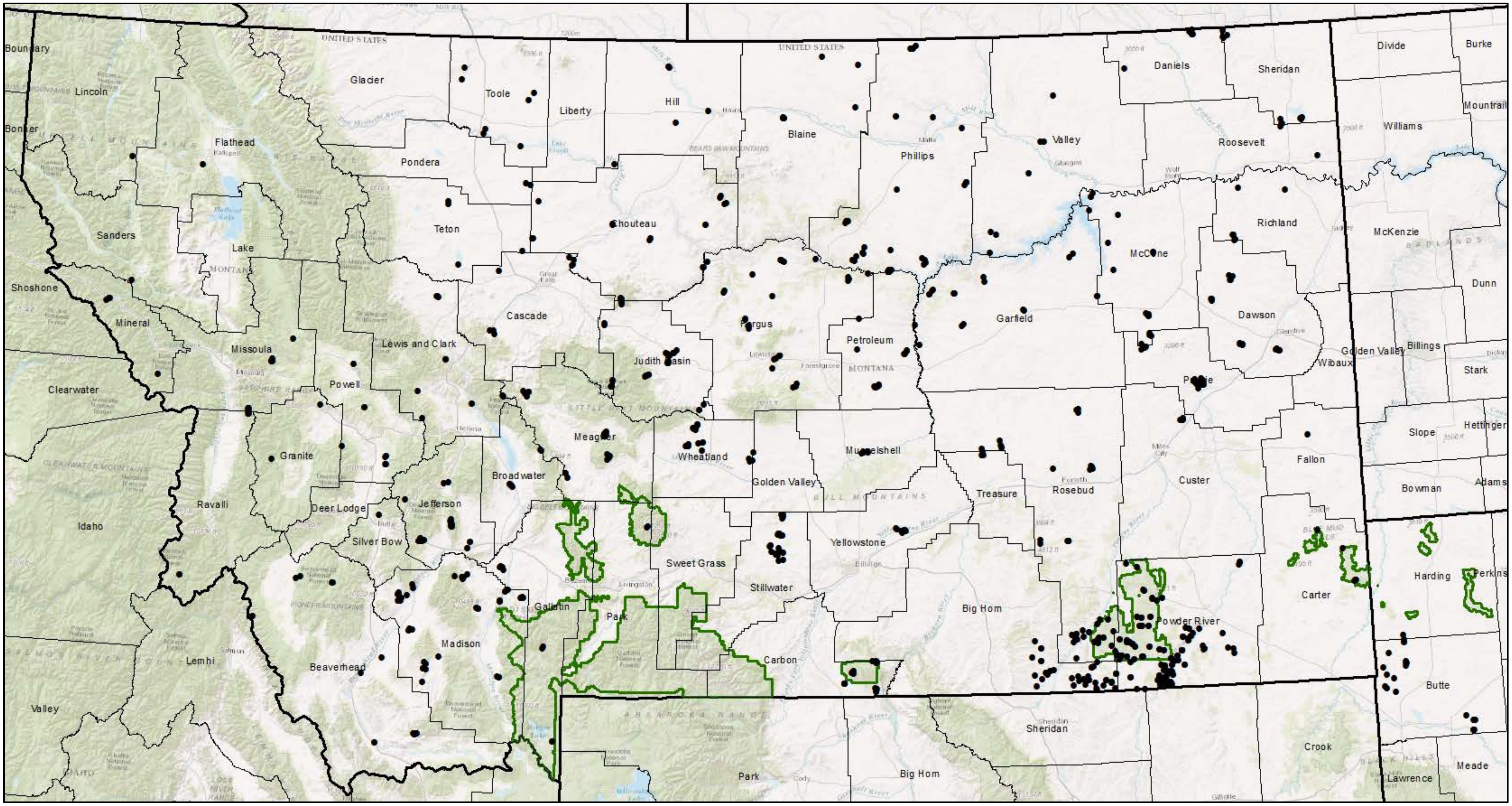

Figure 5. Overview of detections of Western Tiger Salamander (red cross). See Figure 2 for an overview of visual encounter and dipnet survey locations capable of detecting the species. See Table 2 for summaries of the proportion of suitable standing water body surveys the species was detected at.

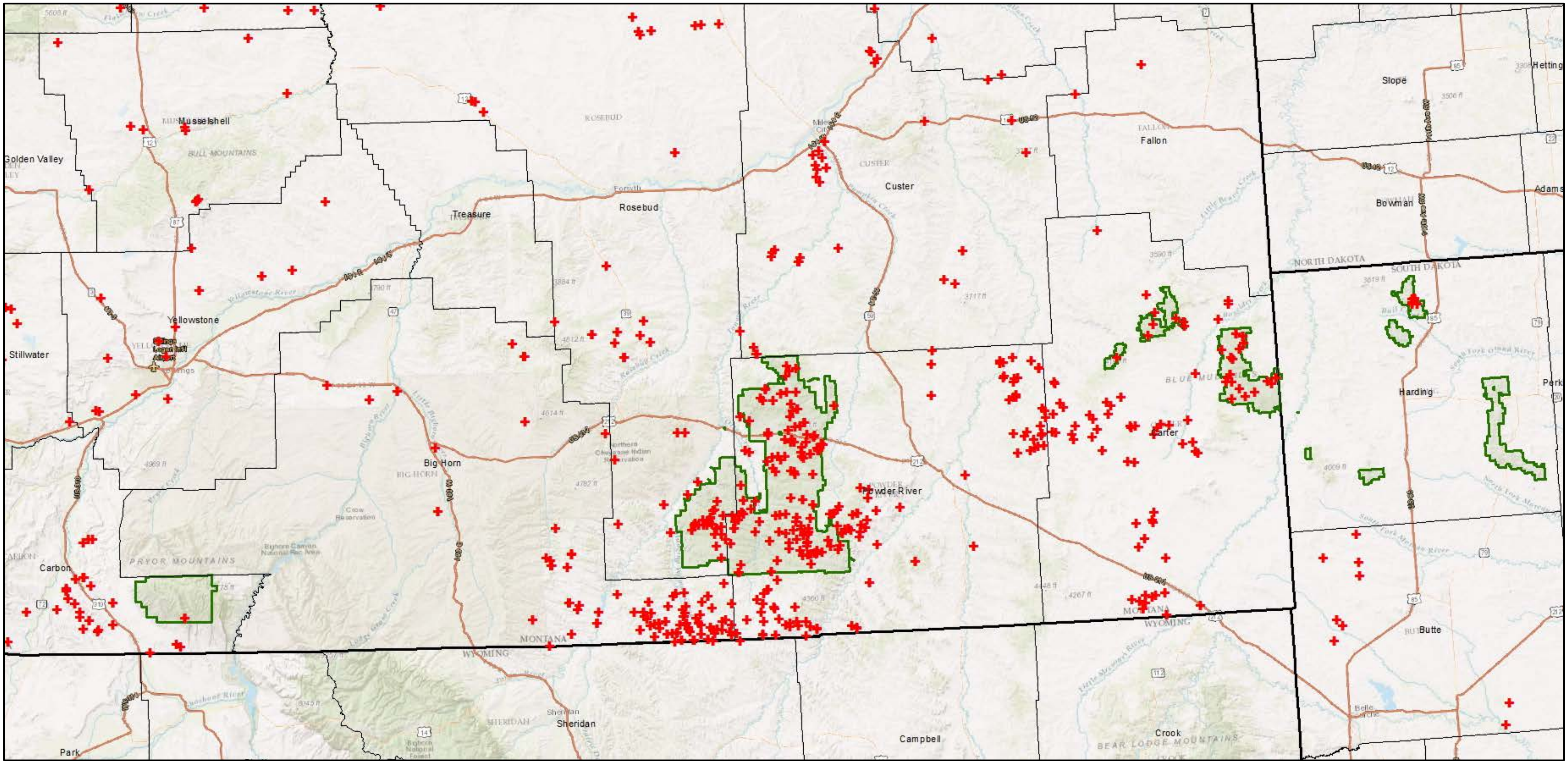

Figure 6. Overview of detections of Great Plains Toad. See Figures 2 and 3 for an overview of visual encounter, dipnet, and passive listening survey locations capable of detecting the species. See Tables 2 and 3 for summaries of the proportion of suitable standing water body and passive listening station surveys the species was detected at.

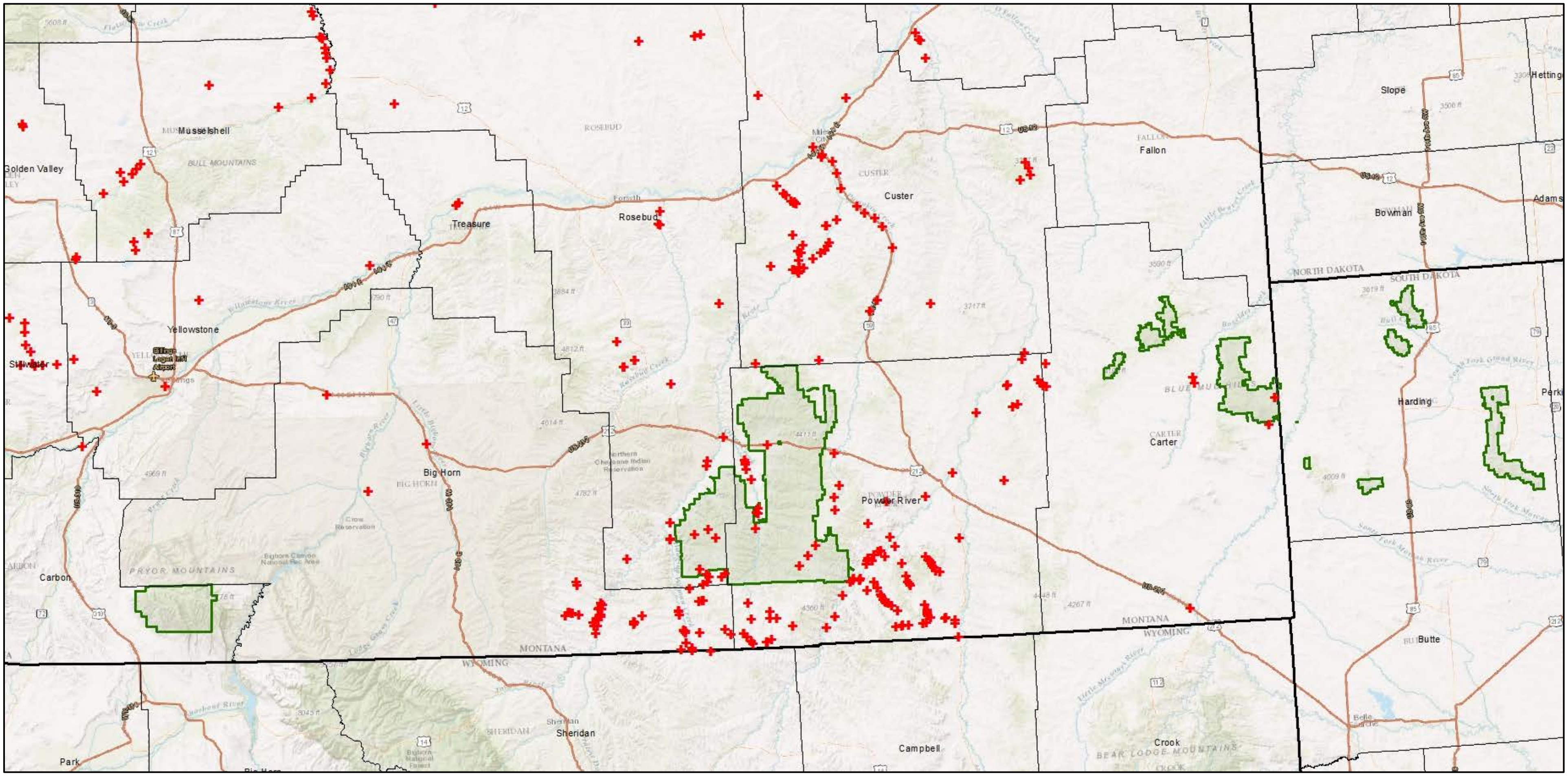

Figure 7. Overview of detections of Woodhouse's Toad. See Figures 2 and 3 for an overview of visual encounter, dipnet, and passive listening survey locations capable of detecting the species. See Tables 2 and 3 for summaries of the proportion of suitable standing water body and passive listening station surveys the species was detected at.

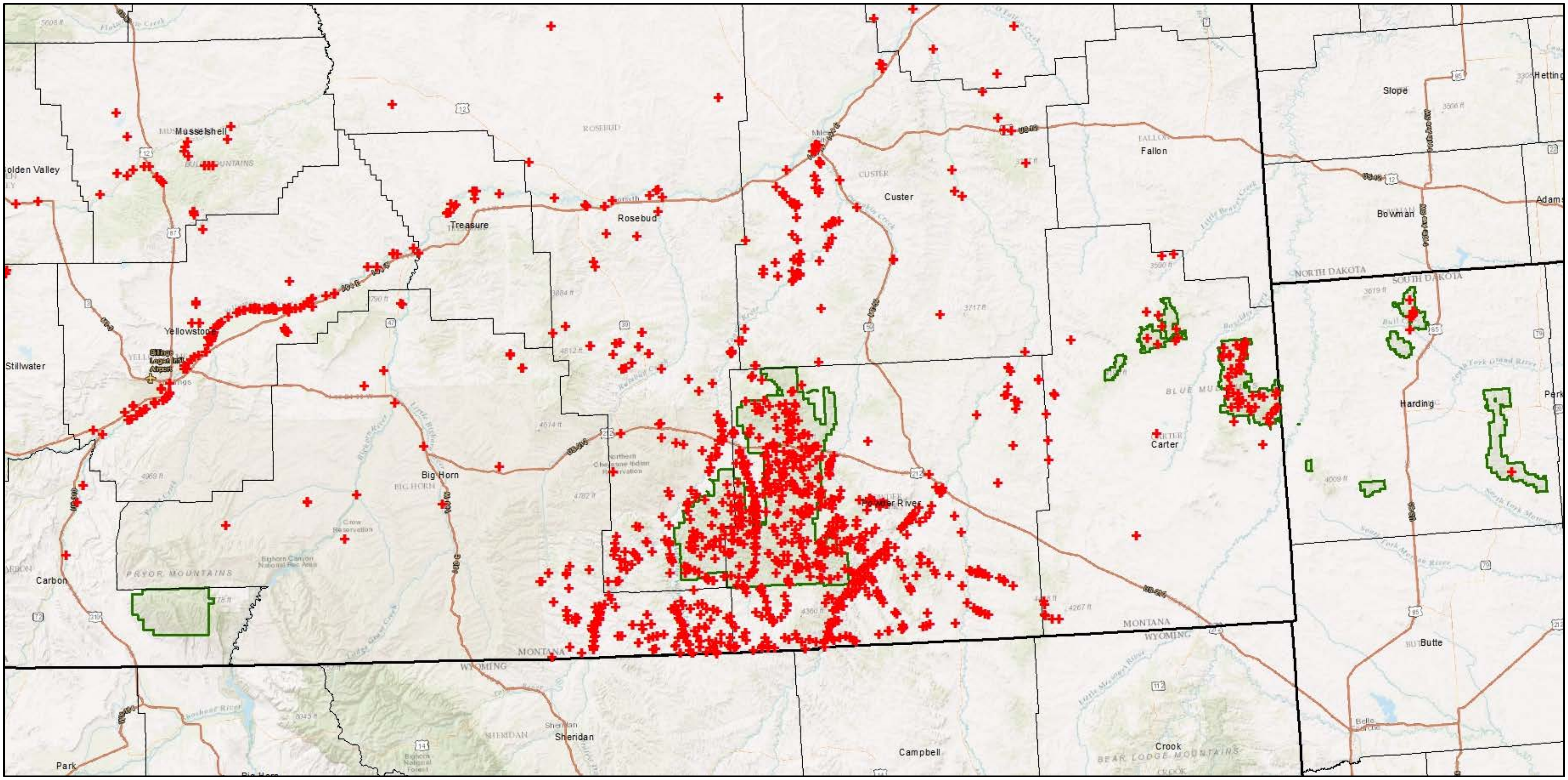

Figure 8. Overview of detections of Boreal Chorus Frog. See Figures 2 and 3 for an overview of visual encounter, dipnet, and passive listening survey locations capable of detecting the species. See Tables 2 and 3 for summaries of the proportion of suitable standing water body and passive listening station surveys the species was detected at.

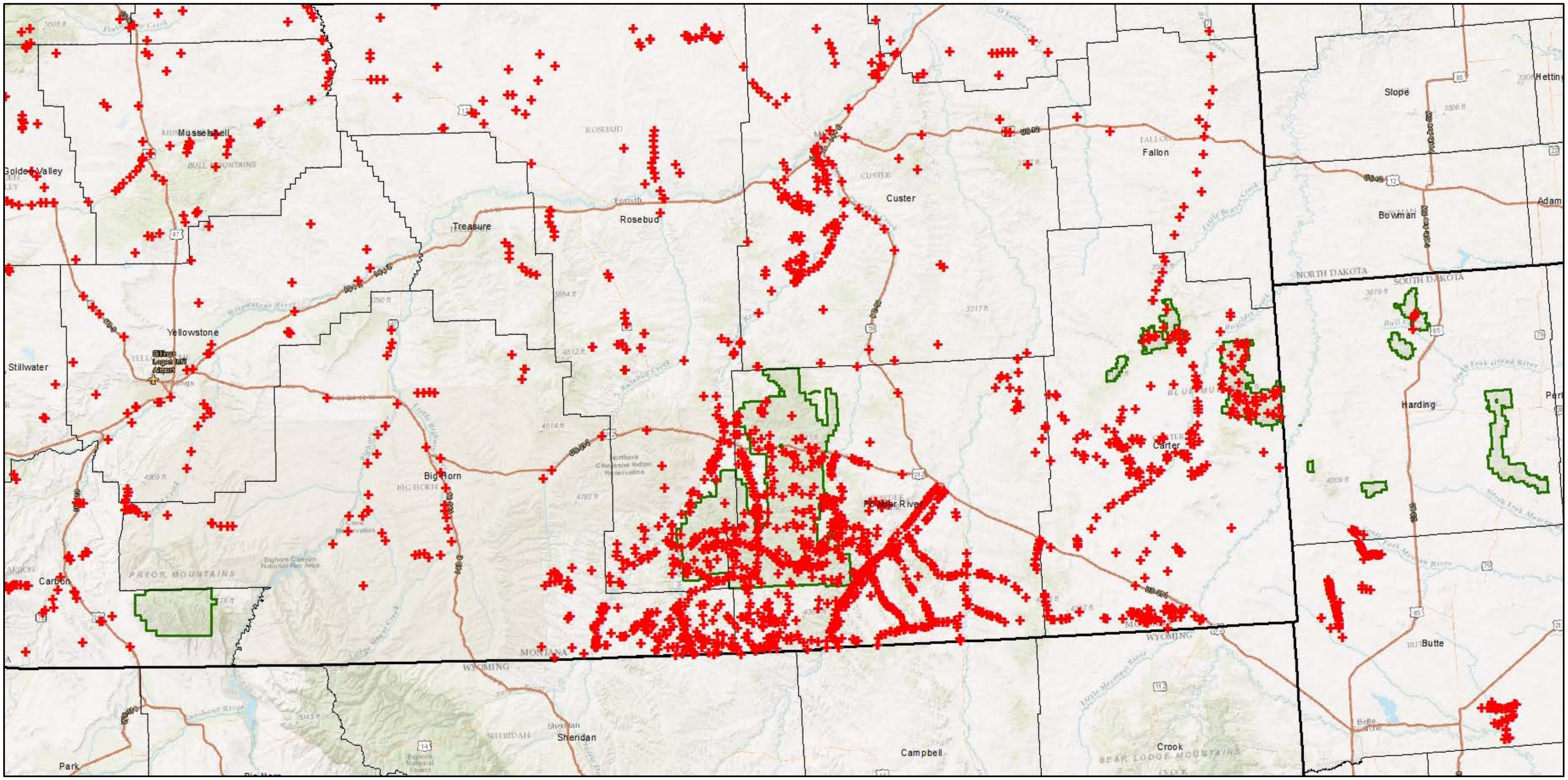

Figure 9. Overview of detections of Plains Spadefoot. See Figures 2 and 3 for an overview of visual encounter, dipnet, and passive listening survey locations capable of detecting the species. See Tables 2 and 3 for summaries of the proportion of suitable standing water body and passive listening station surveys the species was detected at.

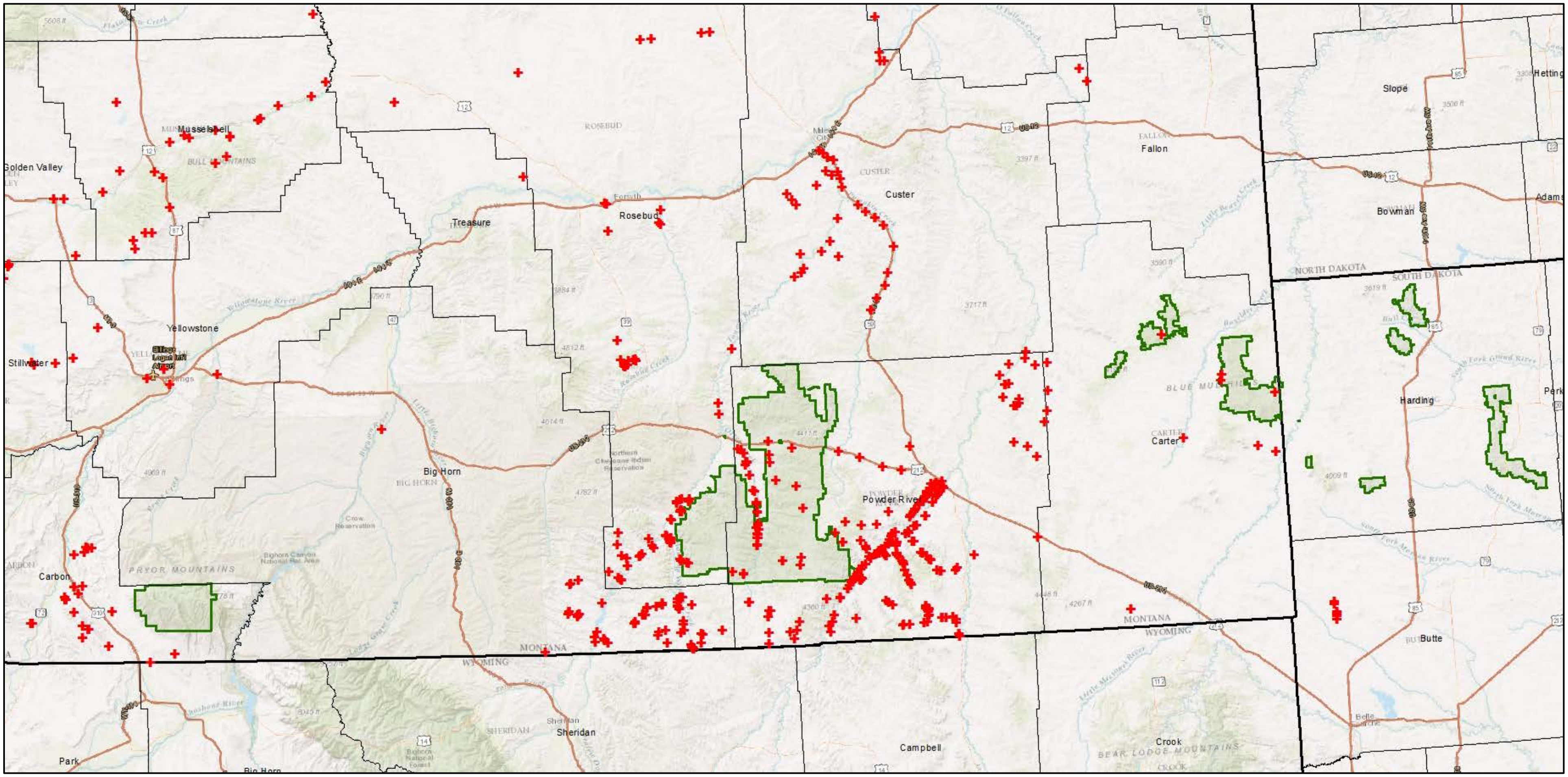

Figure 10. Overview of detections of American Bullfrog. See Figures 2 and 3 for an overview of visual encounter, dipnet, and passive listening survey locations capable of detecting the species. The only location we detected the species was on the upper Stocker Branch of O'Dell Creek. Not shown are six recent passive listening station detections for the species along the Tongue River corridor. American Bullfrog breeding calls can be confused with the sound of wing reverberations produced by Common Nighthawk (*Chordeiles minor*) during display flights so these reports need confirmation before they will be accepted into the Montana Natural Heritage Program's databases.

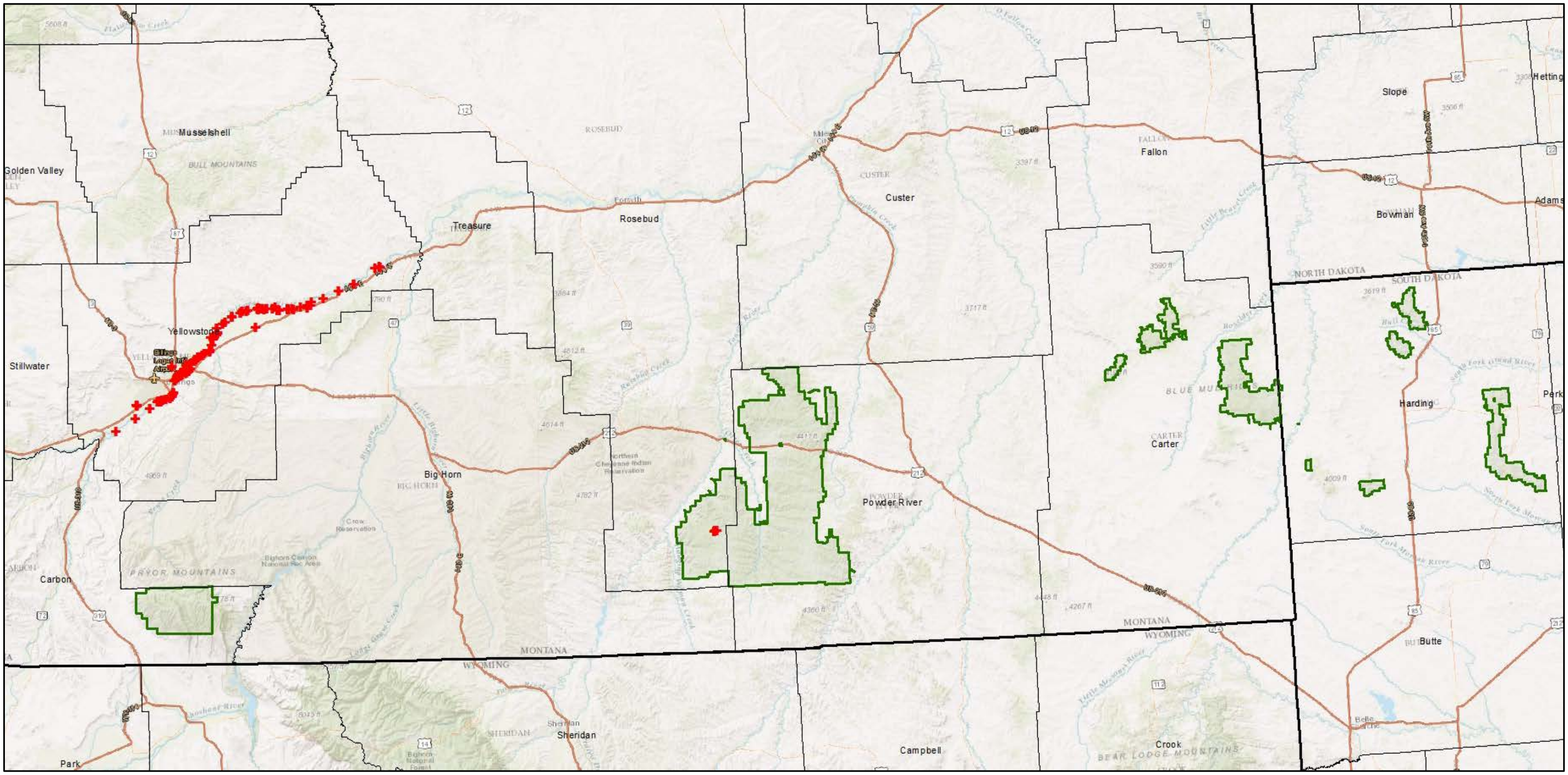

Figure 11. Overview of detections of Northern Leopard Frog. See Figures 2 and 3 for an overview of visual encounter, dipnet, and passive listening survey locations capable of detecting the species. See Tables 2 and 3 for summaries of the proportion of suitable standing water body and passive listening station surveys the species was detected at.

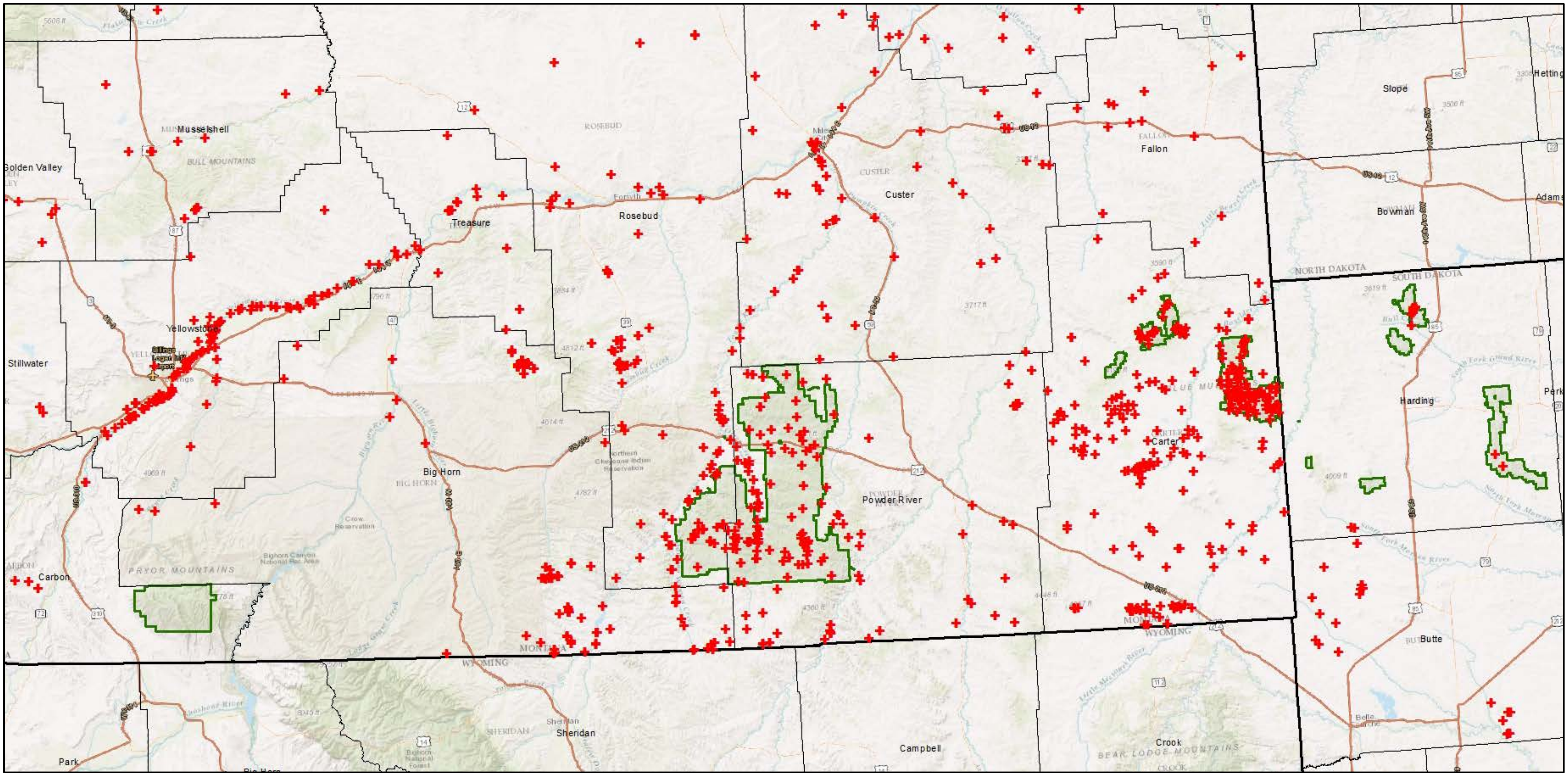

Figure 12. Overview of detections of Snapping Turtle. See Figure 2 for an overview of visual encounter and dipnet survey locations capable of detecting the species. See Table 2 for summaries of the proportion of suitable standing water body surveys the species was detected at.

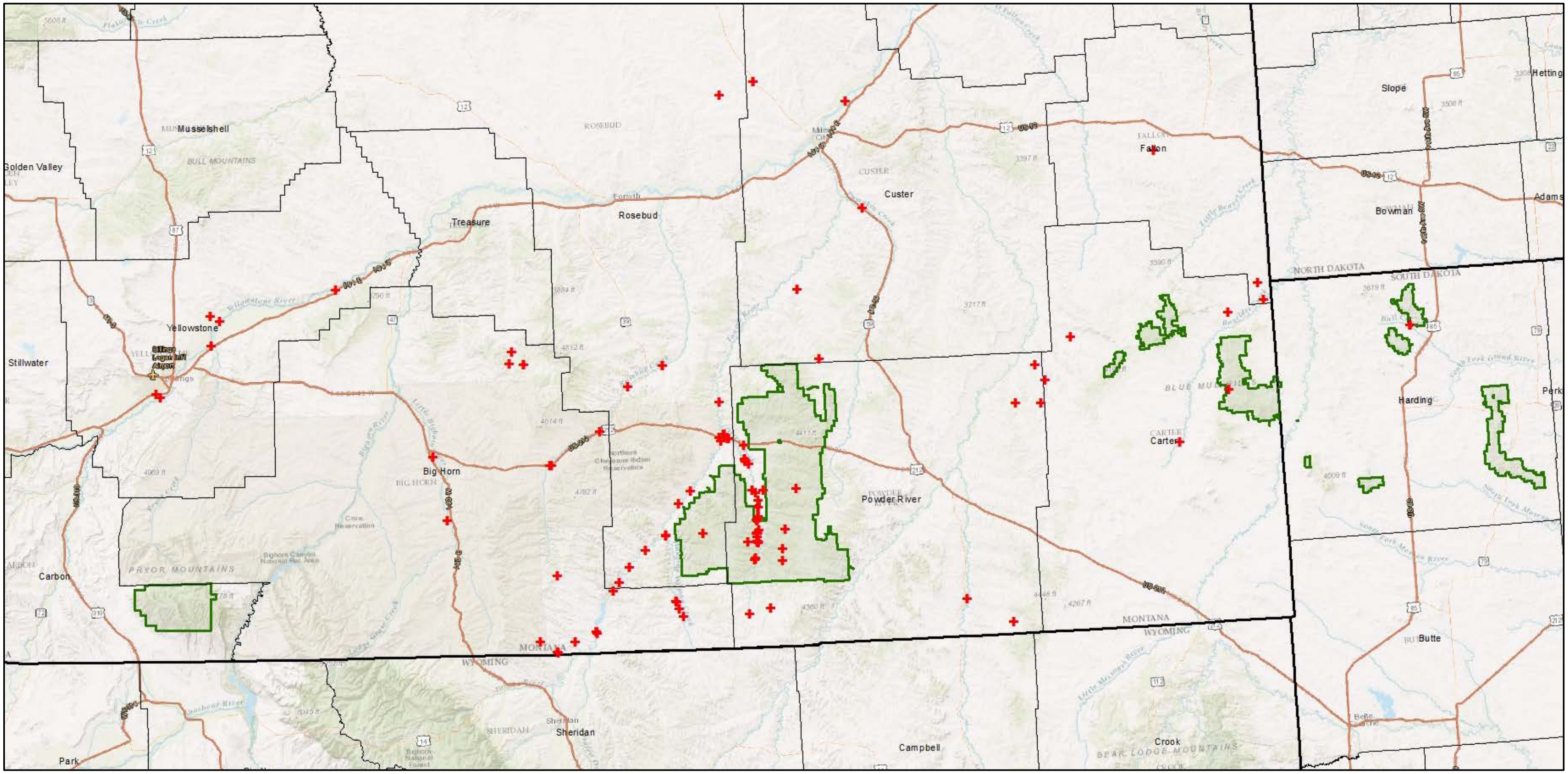

Figure 13. Overview of detections of Painted Turtle. See Figure 2 for an overview of visual encounter and dipnet survey locations capable of detecting the species. See Table 2 for summaries of the proportion of suitable standing water body surveys the species was detected at.

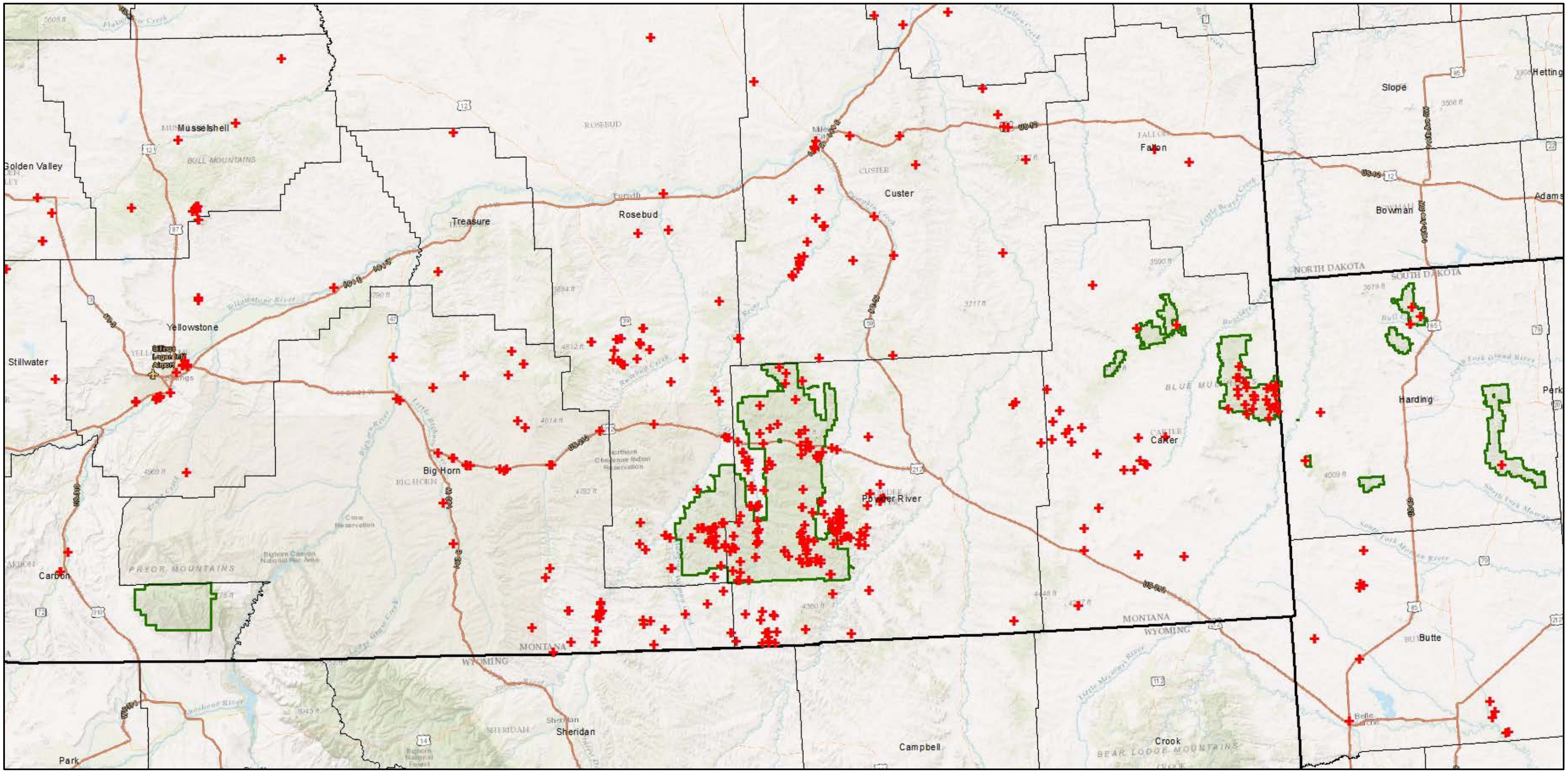

Figure 14. Overview of detections of Spiny Softshell. This species was not targeted for survey and is not believed to be present on units of the Custer Gallatin National Forest, but it is possible that are present in tributaries to the Tongue River during portions of the year.

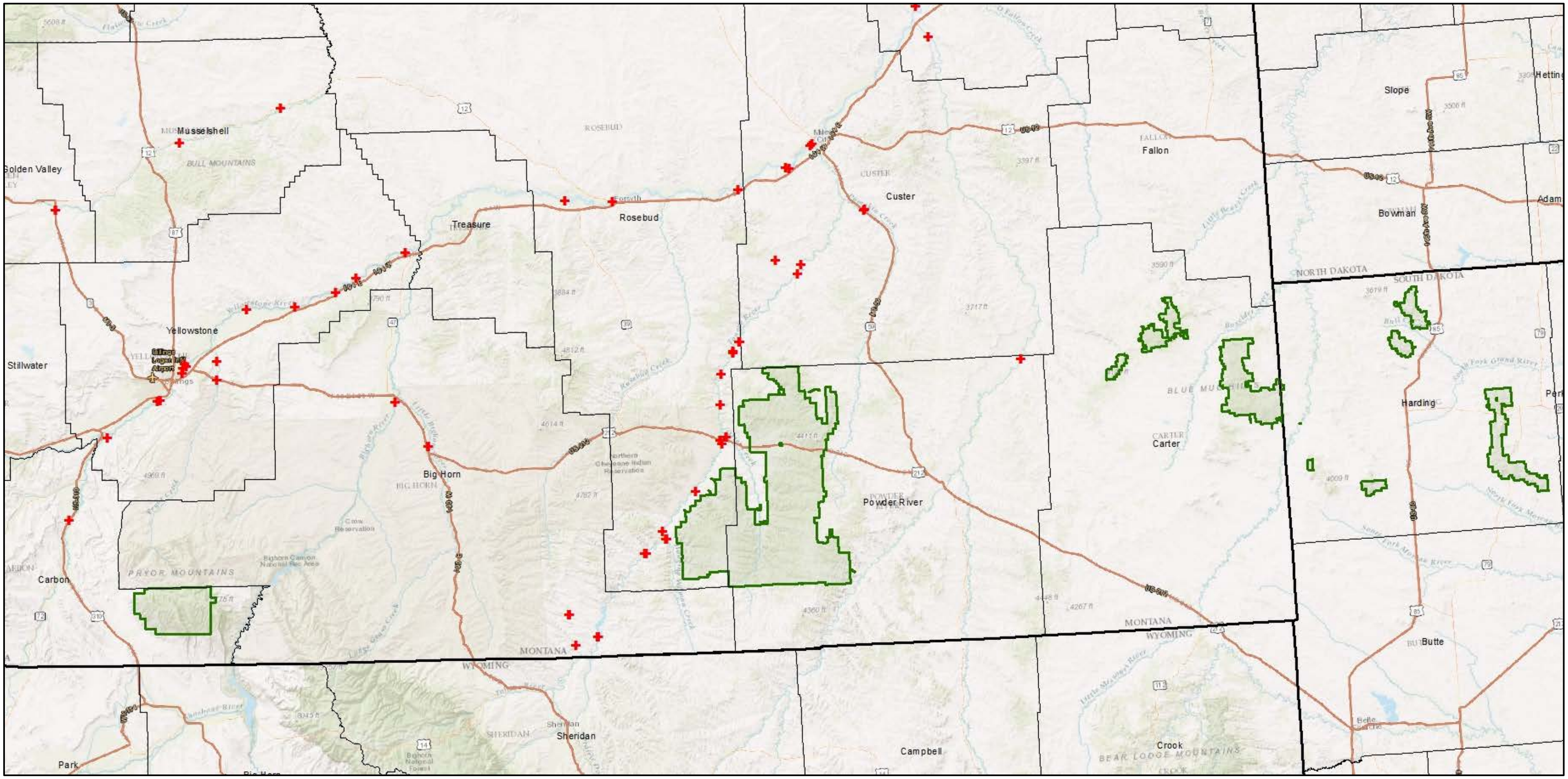

Figure 15. Overview of detections of Greater Short-horned Lizard. The species is likely present in low numbers on all Forest Service units shown in the map below. It was not targeted for survey due to the extremely low detection probabilities associated with surveys targeting it. Informing U.S. Forest Service personnel and local private land owners about the species' preference for sandy to gravelly soils in grasslands and shrublands with good solar exposure is likely the best way to accumulate incidental observations.

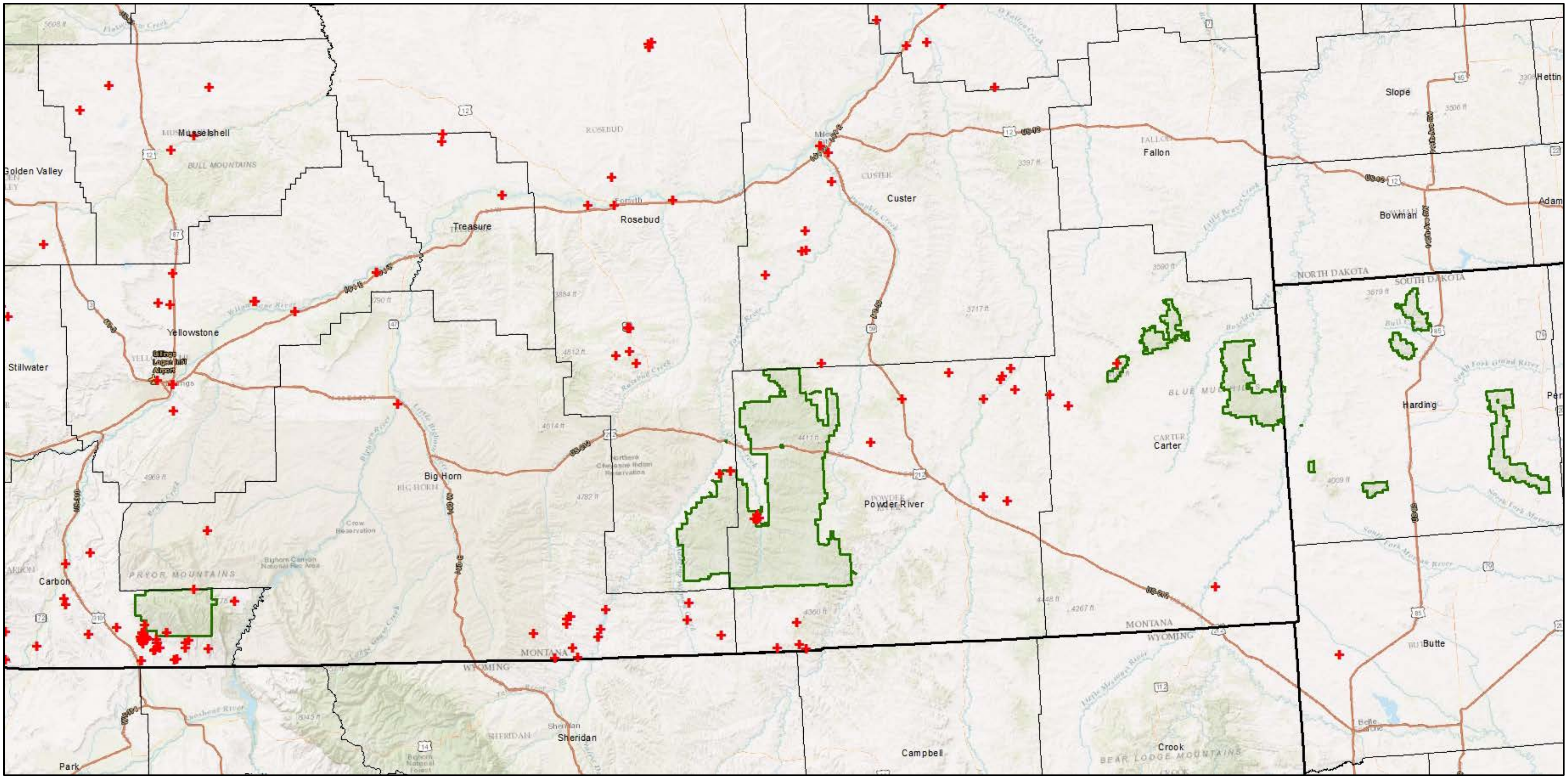

Figure 16. Overview of detections of Common Sagebrush Lizard. See Figure 4 for an overview of visual encounter survey locations at cliff, talus, and rock outcrop sites capable of detecting the species. See Table 4 for summaries of the proportion of rock outcrop surveys the species was detected at.

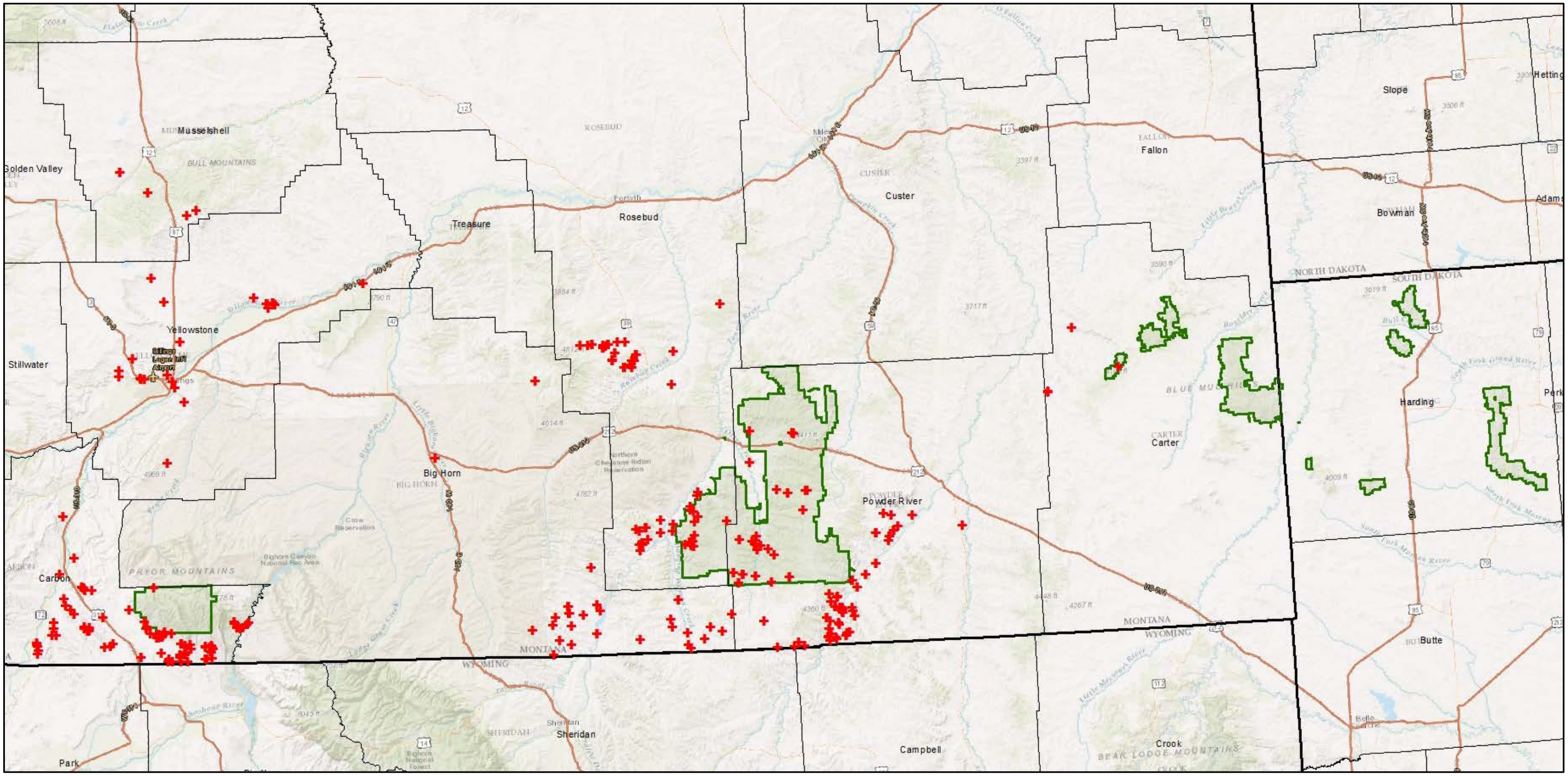

Figure 17. Overview of detections of Northern Rubber Boa. Prior to 2008, this species had not been reported east of Red Lodge. In 2008, we detected the species during a rock outcrop survey in the Dale Creek drainage, a tributary to upper Rosebud Creek. Since then, it has been reported on the southeastern flank of the Pryor Mountains and at two localities along the Tongue River. The species is known to occur in the vicinity of Sheridan, Wyoming. It seems likely the both the Pryor Mountains and Ashland units are occupied by the species to some extent. Education of U.S. Forest Service personnel and local private citizens is likely the best way to accumulate incidental observations of the species.

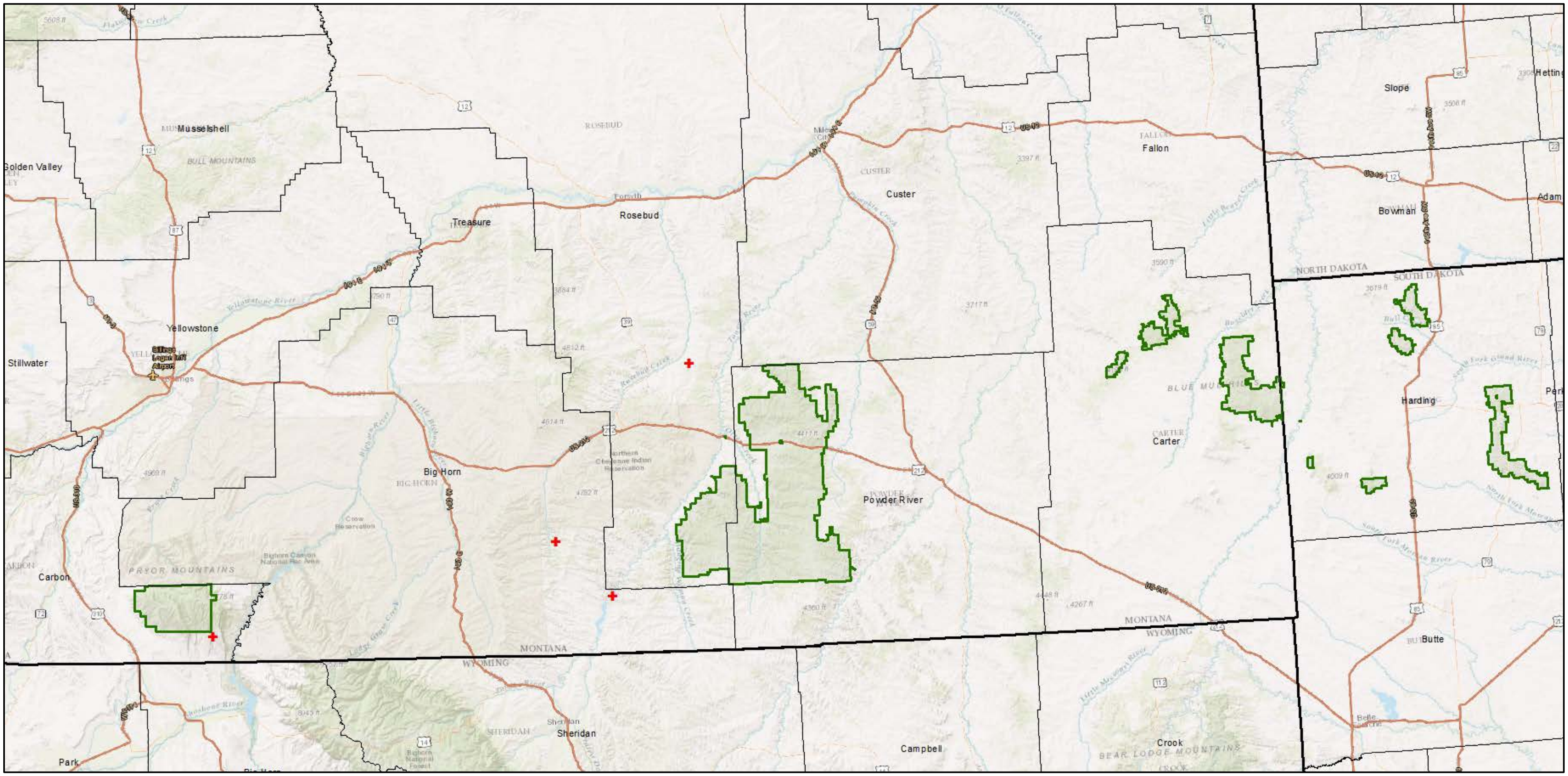

Figure 18. Overview of detections of North American Racer. See Figure 4 for an overview of visual encounter survey locations at cliff, talus, and rock outcrop sites capable of detecting the species. See Table 4 for summaries of the proportion of rock outcrop surveys the species was detected at.

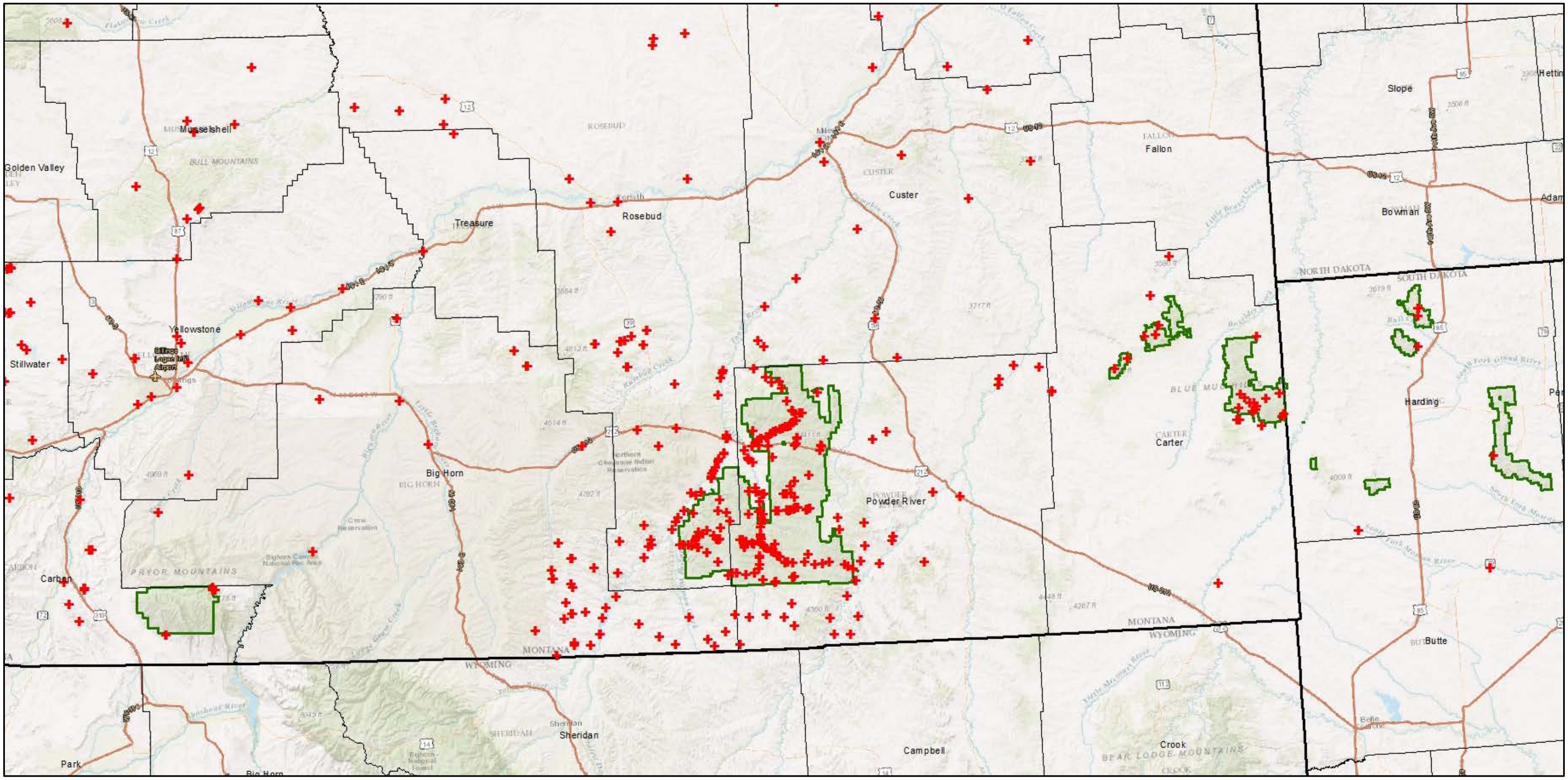

Figure 19. Overview of detections of Plains Hog-nosed Snake. This species was not targeted for survey due to the extremely low detection probabilities associated with surveys targeting it. Education of U.S. Forest Service personnel and local private citizens is likely the best way to accumulate incidental observations of the species in its preferred sandy soil habitats.

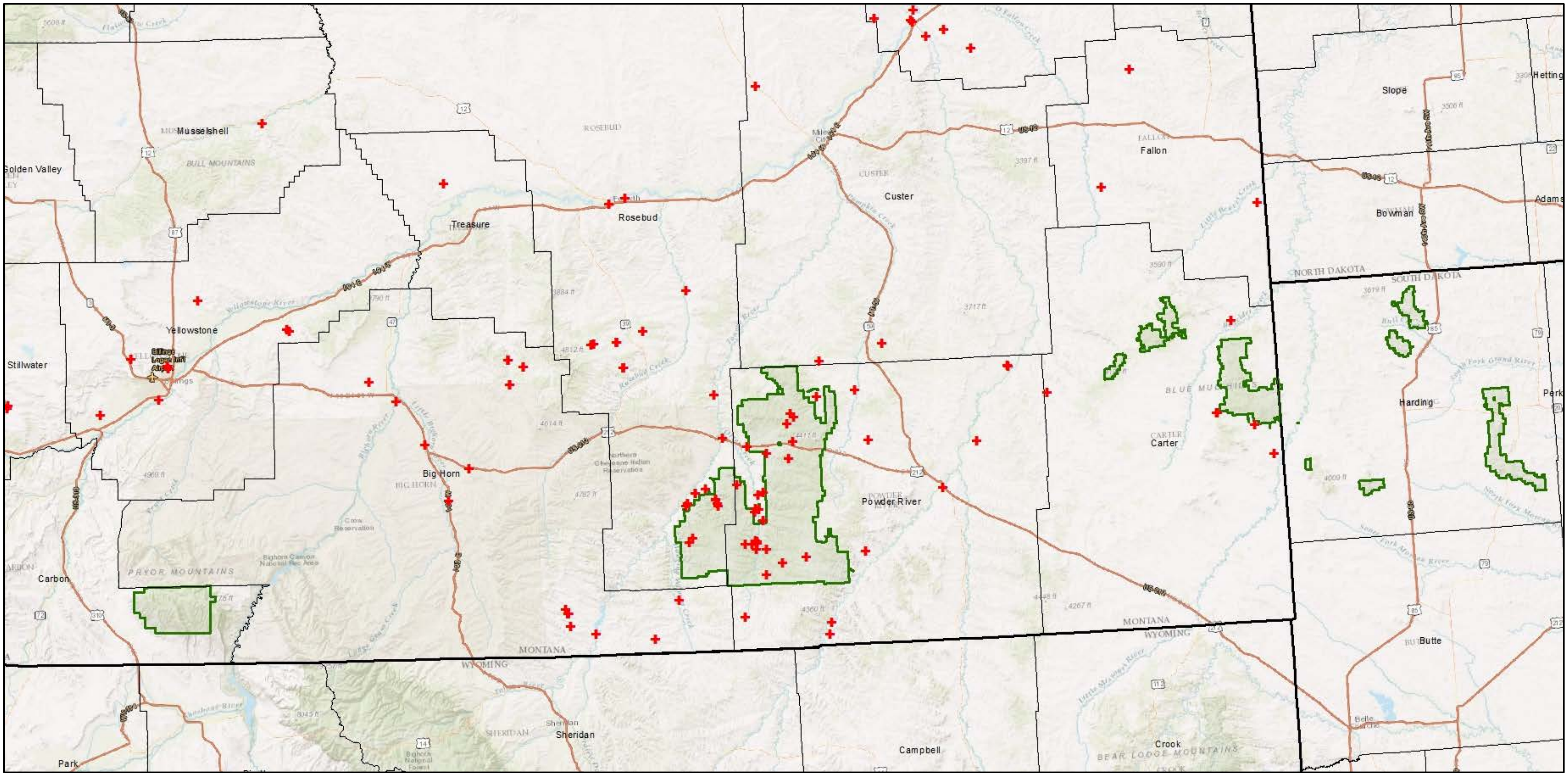

Figure 20. Overview of detections of Western Milksnake. See Figure 4 for an overview of visual encounter survey locations at cliff, talus, and rock outcrop sites capable of detecting the species. See Table 4 for summaries of the proportion of rock outcrop surveys the species was detected at.

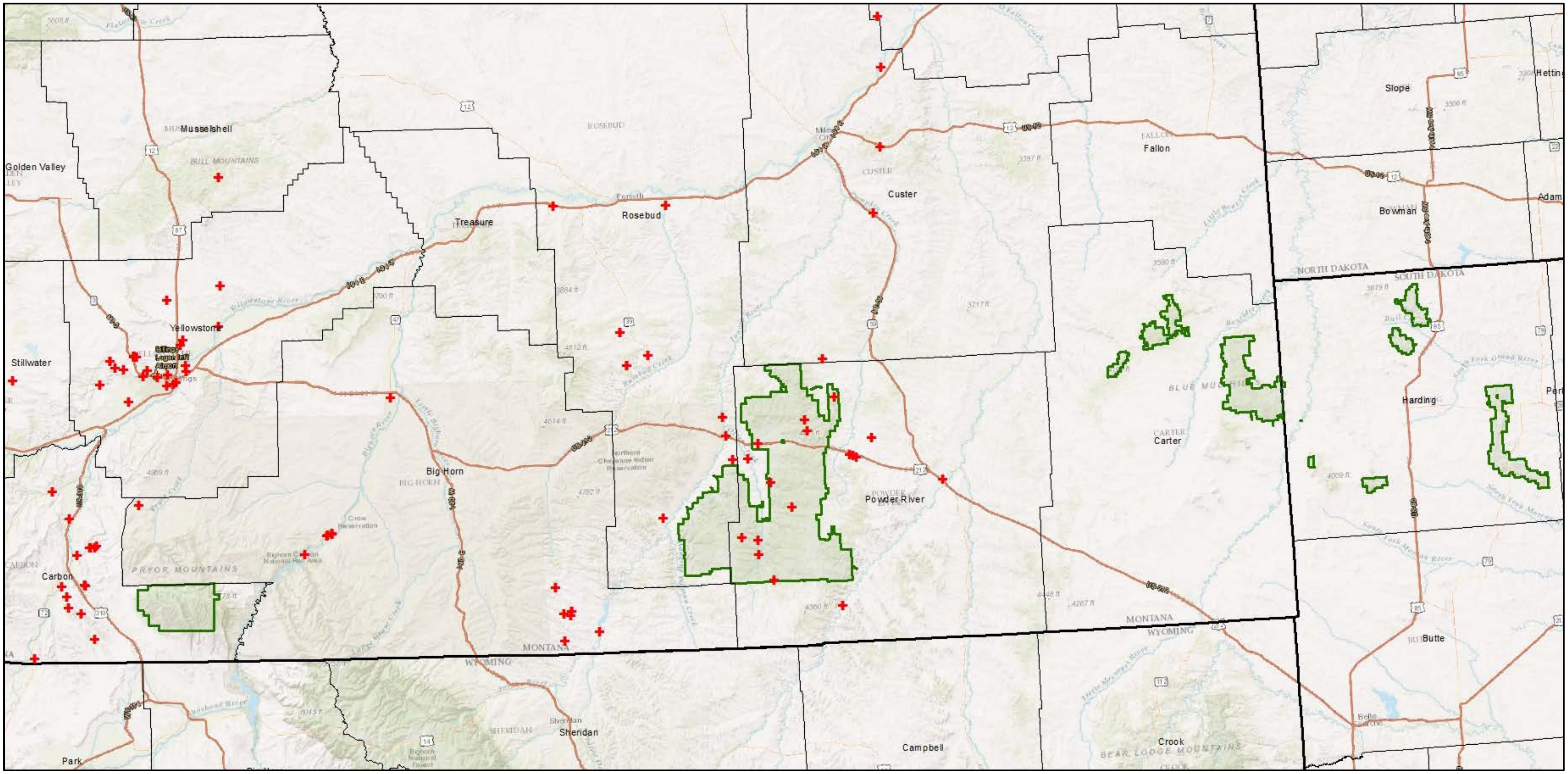

Figure 21. Overview of detections of Gophersnake. See Figure 4 for an overview of visual encounter survey locations at cliff, talus, and rock outcrop sites capable of detecting the species. See Table 4 for summaries of the proportion of rock outcrop surveys the species was detected at.

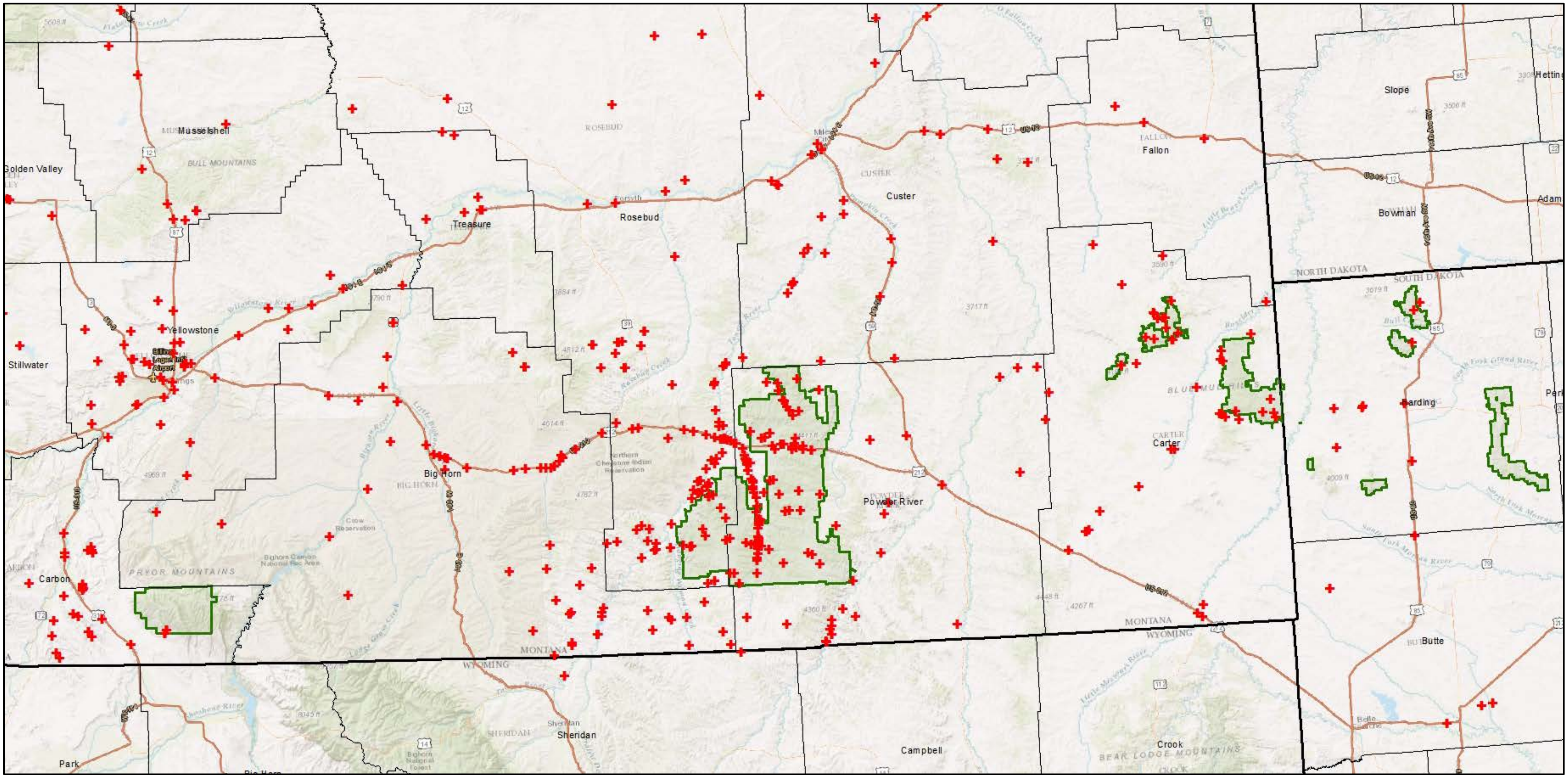

Figure 22. Overview of detections of Terrestrial Gartersnake. See Figure 2 for an overview of visual encounter and dipnet survey locations capable of detecting the species. See Table 2 for summaries of the proportion of standing water bodies the species was detected at.

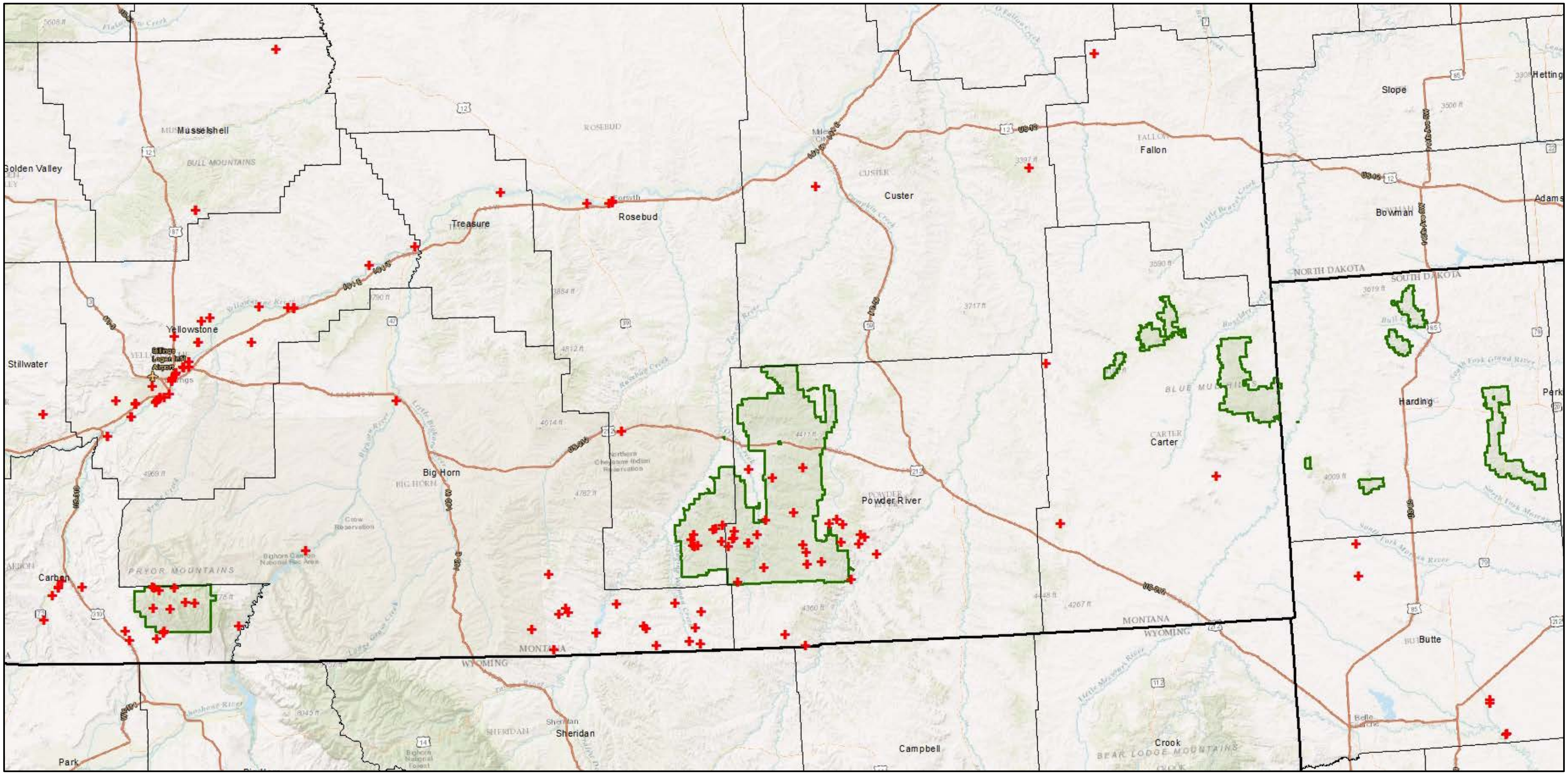

Figure 23. Overview of detections of Plains Gartersnake. See Figure 2 for an overview of visual encounter and dipnet survey locations capable of detecting the species. See Table 2 for summaries of the proportion of standing water bodies the species was detected at.

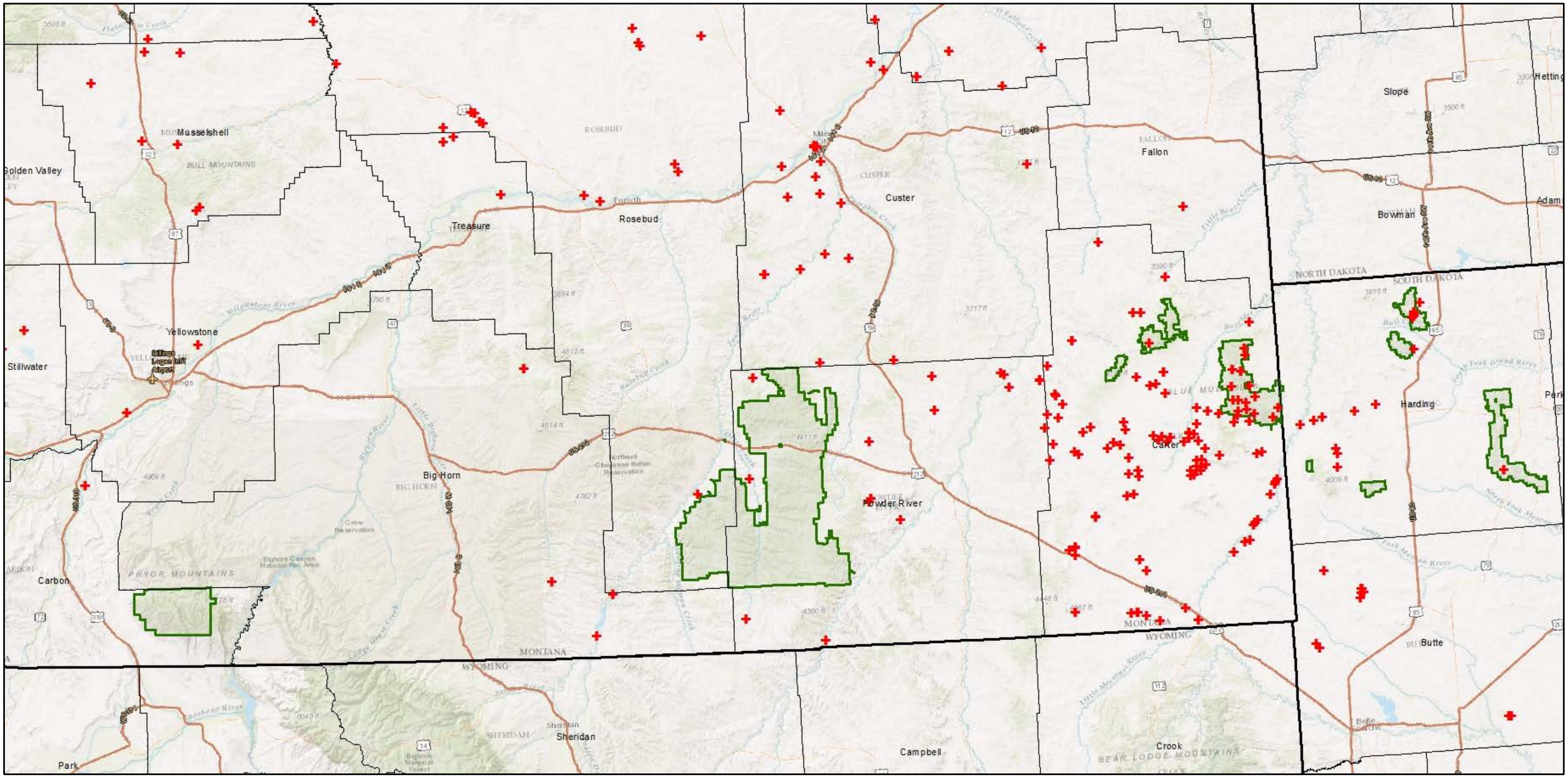

Figure 24. Overview of detections of Common Gartersnake. See Figure 2 for an overview of visual encounter and dipnet survey locations capable of detecting the species. See Table 2 for summaries of the proportion of standing water bodies the species was detected at.

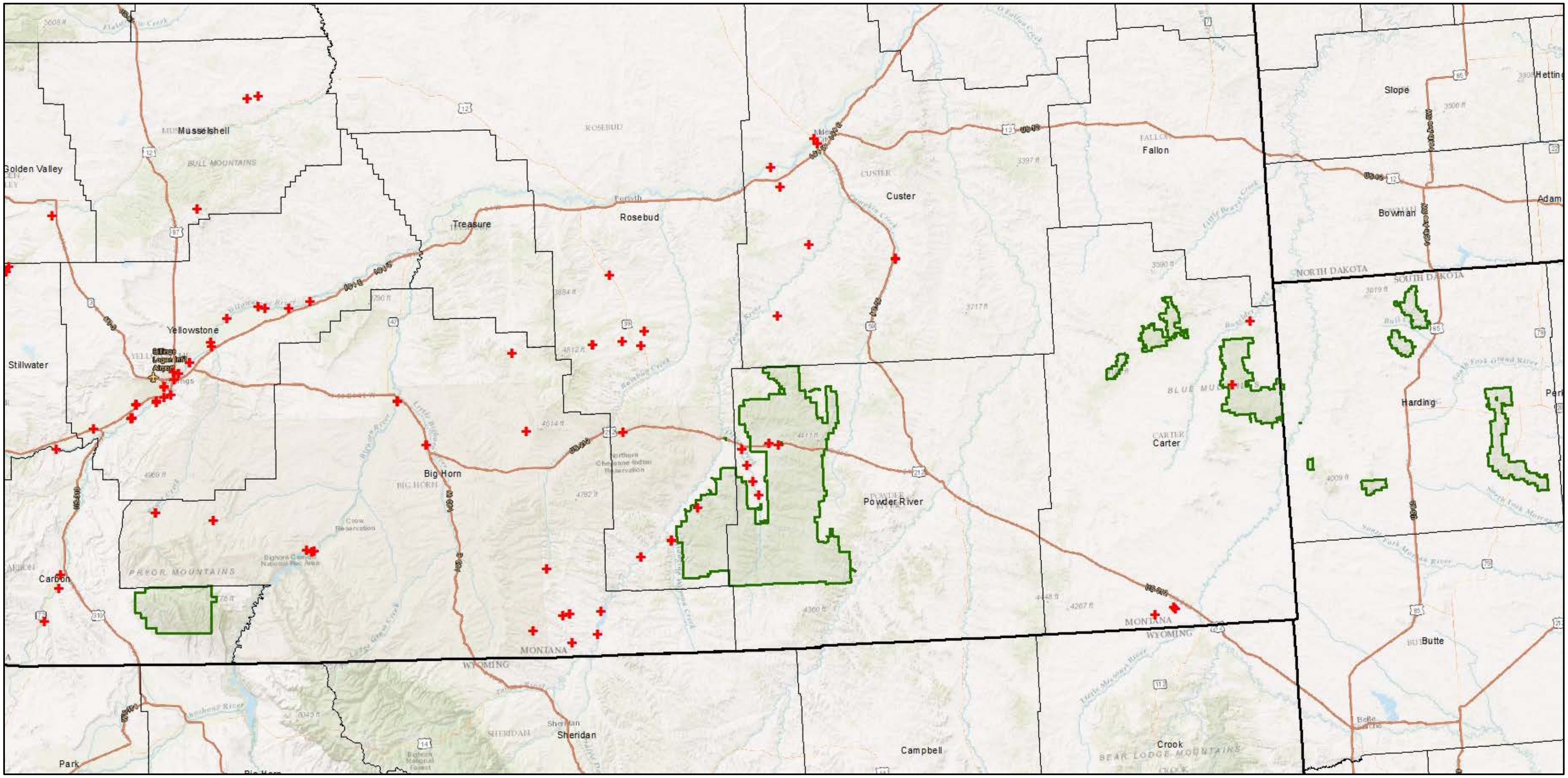

Figure 25. Overview of detections of Prairie Rattlesnake. See Figure 4 for an overview of visual encounter survey locations at cliff, talus, and rock outcrop sites capable of detecting the species. See Table 4 for summaries of the proportion of rock outcrop surveys the species was detected at.

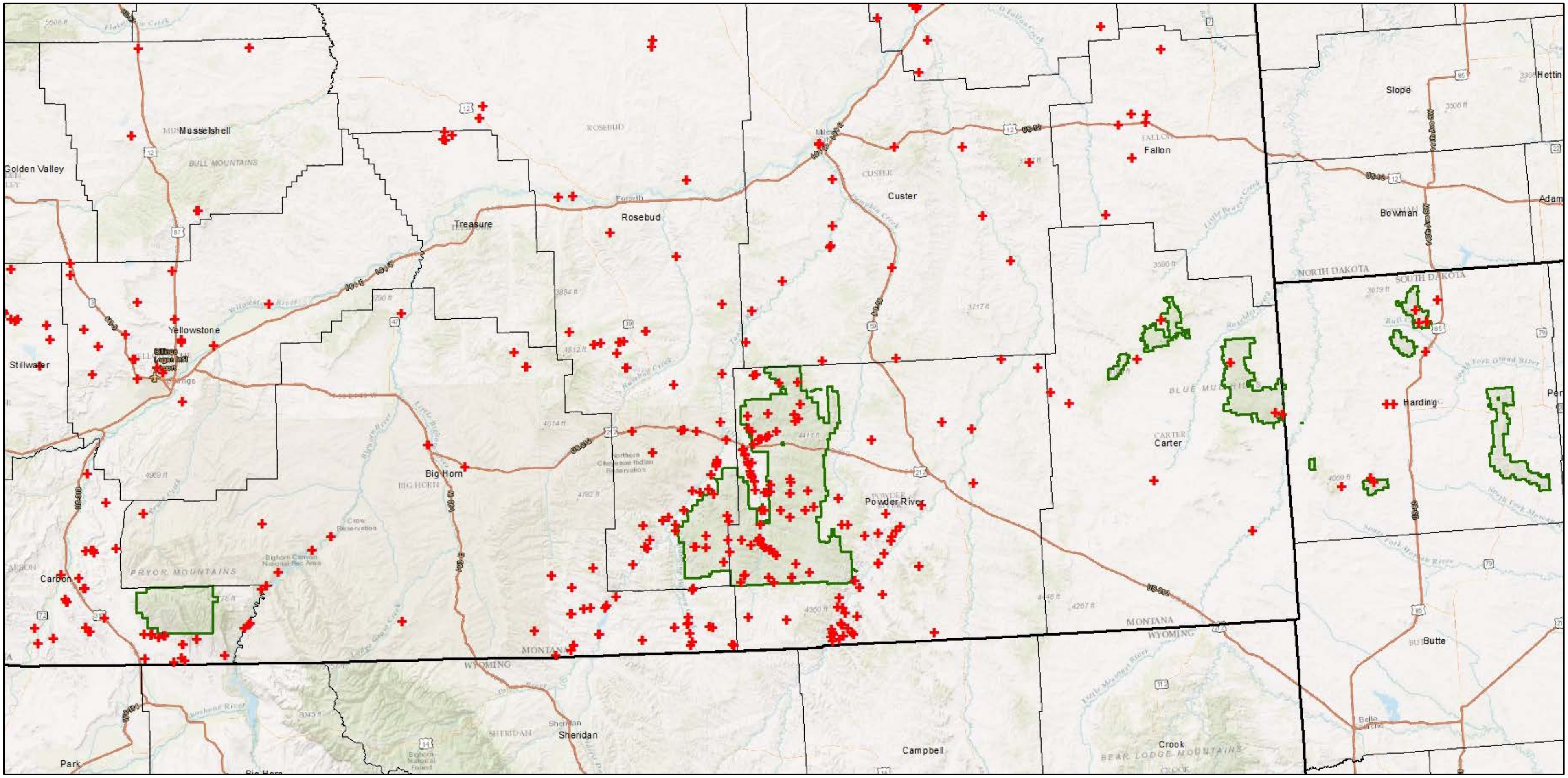

Table 1. Summary of amphibian and reptile survey efforts, and detections of amphibian and reptile species, on units of the Ashland, Beartooth, and Sioux Ranger Districts since 2002. Note that in many cases field crews performed numerous additional surveys on lands adjacent to these units that were paid for with other funding sources (see Figures 2-4).

Forest Unit	Year	No. Potential Standing Water Body Sites Surveyed	No. Sites Surveyed with Suitable Standing Water Habitats	No. Passive Listening Stations Surveyed	No. Rock Outcrops Surveyed	No. of USFS Sensitive Herpetofauna Species Detections	No. of Non USFS Sensitive Herpetofauna Species Detections
Ashland	2002	336	143	0	0	24	152
	2004	176	70	0	0	8	96
	2005	317	181	22	17	27	285
	2008	9	3	52	22	2	56
	2009	1	1	4	4	1	5
	2010	0	0	105	41	0	26
Pryor Mountains	2005	22	11	0	0	0	1
	2009	0	0	2 [a]	5 [a]	0	0
	2013	71	33	0	0	0	3
Chalk Buttes	2010	12	2	0	0	0	1
Ekalaka Hills	2009	0	0	0	1	0	0
	2010	35	14	0	0	14	9
Long Pines	2009	0	0	0	1	0	0
	2010	61	36	0	0	24	54
	2012	112	58	0	0	64	80
North Cave Hills	2015	9	9	0	0	8	18

[a] from Hanauska-Brown et al. (2014).

Table 2. Species detected, and proportion of sites surveyed that contained suitable standing water habitats that they were detected at, on units of the Ashland, Beartooth, and Sioux Districts summarized by year. The table is sorted first by forest unit, then year, then taxonomically. Rows with empty cells for common and scientific name and state rank indicate statistics for sites where no species were detected on a given year. See Appendix A for Montana status and state rank definitions.

Forest Unit	Year	Common Name	Scientific Name	State Rank	No. Sites Detected	Proportion (SE) of Sites Detected
Ashland	2002				49	0.343 (0.04)
Ashland	2002	Western Tiger Salamander	*Ambystoma mavortium*	S4	13	0.091 (0.024)
Ashland	2002	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	56	0.392 (0.041)
Ashland	2002	Boreal Chorus Frog	*Pseudacris maculata*	S4	52	0.364 (0.04)
Ashland	2002	Northern Leopard Frog	*Lithobates pipiens*	S4	22	0.154 (0.03)
Ashland	2002	Snapping Turtle	*Chelydra serpentina*	S3	1	0.007 (0.007)
Ashland	2002	Painted Turtle	*Chrysemys picta*	S4	24	0.168 (0.031)
Ashland	2002	Gophersnake	*Pituophis catenifer*	S5	1	0.007 (0.007)
Ashland	2002	Terrestrial Gartersnake	*Thamnophis elegans*	S5	1	0.007 (0.007)
Ashland	2004				23	0.329 (0.056)
Ashland	2004	Western Tiger Salamander	*Ambystoma mavortium*	S4	28	0.4 (0.059)
Ashland	2004	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	26	0.371 (0.058)
Ashland	2004	Boreal Chorus Frog	*Pseudacris maculata*	S4	20	0.286 (0.054)
Ashland	2004	Northern Leopard Frog	*Lithobates pipiens*	S4	8	0.114 (0.038)
Ashland	2004	Painted Turtle	*Chrysemys picta*	S4	14	0.2 (0.048)
Ashland	2004	Terrestrial Gartersnake	*Thamnophis elegans*	S5	3	0.043 (0.024)
Ashland	2005				40	0.221 (0.031)
Ashland	2005	Western Tiger Salamander	*Ambystoma mavortium*	S4	70	0.387 (0.036)
Ashland	2005	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	92	0.508 (0.037)
Ashland	2005	Boreal Chorus Frog	*Pseudacris maculata*	S4	53	0.293 (0.034)
Ashland	2005	Plains Spadefoot	*Spea bombifrons*	S3	4	0.022 (0.011)
Ashland	2005	Northern Leopard Frog	*Lithobates pipiens*	S4	20	0.11 (0.023)
Ashland	2005	Snapping Turtle	*Chelydra serpentina*	S3	1	0.006 (0.006)
Ashland	2005	Painted Turtle	*Chrysemys picta*	S4	26	0.144 (0.026)
Ashland	2005	North American Racer	*Coluber constrictor*	S5	3	0.017 (0.01)
Ashland	2005	Gophersnake	*Pituophis catenifer*	S5	1	0.006 (0.006)
Ashland	2005	Terrestrial Gartersnake	*Thamnophis elegans*	S5	4	0.022 (0.011)
Ashland	2005	Common Gartersnake	*Thamnophis sirtalis*	S4	1	0.006 (0.006)
Ashland	2008	Western Tiger Salamander	*Ambystoma mavortium*	S4	2	0.667 (0.272)
Ashland	2008	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	2	0.667 (0.272)
Ashland	2008	Boreal Chorus Frog	*Pseudacris maculata*	S4	3	1 (0)
Ashland	2008	Painted Turtle	*Chrysemys picta*	S4	1	0.333 (0.272)
Ashland	2008	Terrestrial Gartersnake	*Thamnophis elegans*	S5	1	0.333 (0.272)
Ashland	2009	Western Tiger Salamander	*Ambystoma mavortium*	S4	1	1 (0)
Ashland	2009	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	1	1 (0)
Ashland	2009	Boreal Chorus Frog	*Pseudacris maculata*	S4	1	1 (0)
Ashland	2009	Northern Leopard Frog	*Lithobates pipiens*	S4	1	1 (0)
Ashland	2009	Painted Turtle	*Chrysemys picta*	S4	1	1 (0)
Ashland	2009	Terrestrial Gartersnake	*Thamnophis elegans*	S5	1	1 (0)
Pryor	2005				10	0.909 (0.087)
Pryor	2005	Western Tiger Salamander	*Ambystoma mavortium*	S4	1	0.091 (0.087)
Pryor	2013				30	0.909 (0.05)
Pryor	2013	Western Tiger Salamander	*Ambystoma mavortium*	S4	1	0.03 (0.03)
Pryor	2013	Terrestrial Gartersnake	*Thamnophis elegans*	S5	2	0.061 (0.042)
Chalk Buttes	2010				2	1 (0)

Forest Unit	Year	Common Name	Scientific Name	State Rank	No. Sites Detected	Proportion (SE) of Sites Detected
Ekalaka Hills	2010				1	0.071 (0.069)
Ekalaka Hills	2010	Western Tiger Salamander	*Ambystoma mavortium*	S4	3	0.214 (0.11)
Ekalaka Hills	2010	Boreal Chorus Frog	*Pseudacris maculata*	S4	6	0.429 (0.132)
Ekalaka Hills	2010	Northern Leopard Frog	*Lithobates pipiens*	S4	11	0.786 (0.11)
Long Pines	2010				5	0.139 (0.058)
Long Pines	2010	Western Tiger Salamander	*Ambystoma mavortium*	S4	9	0.25 (0.072)
Long Pines	2010	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	19	0.528 (0.083)
Long Pines	2010	Boreal Chorus Frog	*Pseudacris maculata*	S4	16	0.444 (0.083)
Long Pines	2010	Plains Spadefoot	*Spea bombifrons*	S3	2	0.056 (0.038)
Long Pines	2010	Northern Leopard Frog	*Lithobates pipiens*	S4	21	0.583 (0.082)
Long Pines	2010	Painted Turtle	*Chrysemys picta*	S4	1	0.028 (0.027)
Long Pines	2010	Plains Gartersnake	*Thamnophis radix*	S4	5	0.139 (0.058)
Long Pines	2010	Common Gartersnake	*Thamnophis sirtalis*	S4	1	0.028 (0.027)
Long Pines	2012				3	0.052 (0.029)
Long Pines	2012	Western Tiger Salamander	*Ambystoma mavortium*	S4	6	0.103 (0.04)
Long Pines	2012	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	15	0.259 (0.058)
Long Pines	2012	Boreal Chorus Frog	*Pseudacris maculata*	S4	24	0.414 (0.065)
Long Pines	2012	Northern Leopard Frog	*Lithobates pipiens*	S4	46	0.793 (0.053)
Long Pines	2012	Painted Turtle	*Chrysemys picta*	S4	20	0.345 (0.062)
Long Pines	2012	North American Racer	*Coluber constrictor*	S5	2	0.034 (0.024)
Long Pines	2012	Plains Gartersnake	*Thamnophis radix*	S4	6	0.103 (0.04)
North Cave	2015	Western Tiger Salamander	*Ambystoma mavortium*	S4	6	0.667 (0.157)
North Cave	2015	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	4	0.444 (0.166)
North Cave	2015	Boreal Chorus Frog	*Pseudacris maculata*	S4	4	0.444 (0.166)
North Cave	2015	Northern Leopard Frog	*Lithobates pipiens*	S4	8	0.889 (0.105)
North Cave	2015	Plains Gartersnake	*Thamnophis radix*	S4	4	0.444 (0.166)

Table 3. Species detected, and proportion of passive listening stations they were detected at, on the Ashland District in 2010. Passive listening stations lacking detections of any species were not recorded during the 2005 and 2008 passive listening surveys so proportions cannot be calculated for those years. Species are sorted taxonomically. The row with empty cells for common and scientific name and state rank indicates statistics for stations where no species were detected. See Appendix A for Montana status and state rank definitions.

Forest Unit	Year	Common Name	Scientific Name	State Rank	No. Sites Detected	Proportion (SE) of Sites Detected
Ashland	2010				4	0.038 (0.019)
Ashland	2010	Great Plains Toad	*Anaxyrus cognatus*	S2	36	0.343 (0.046)
Ashland	2010	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	3	0.029 (0.016)
Ashland	2010	Boreal Chorus Frog	*Pseudacris maculata*	S4	4	0.038 (0.019)
Ashland	2010	Plains Spadefoot	*Spea bombifrons*	S3	62	0.59 (0.048)
Ashland	2010	Northern Leopard Frog	*Lithobates pipiens*	S4	37	0.352 (0.047)

Table 4. Species detected, and proportion of cliff, talus, and rock outcrop sites that they were detected at, on the Ashland District in 2005, 2008, and 2010. The table is sorted first by year, then taxonomically. Note that in 2010, surveys were conducted in the early spring and late fall in order to focus on the detection of hibernacula. Detection rates at those times of the year are typically low. Rows with empty cells for common and scientific name and state rank indicate statistics for sites where no species were detected on a given year. See Appendix A for Montana status and state rank definitions.

Forest Unit	Year	Common Name	Scientific Name	State Rank	No. Sites Detected	Proportion (SE) of Sites Detected
Ashland	2005				5	0.294 (0.11)
Ashland	2005	Western Tiger Salamander	*Ambystoma mavortium*	S4	1	0.059 (0.057)
Ashland	2005	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	1	0.059 (0.057)
Ashland	2005	Common Sagebrush Lizard	*Sceloporus graciosus*	S4	11	0.647 (0.116)
Ashland	2005	North American Racer	*Coluber constrictor*	S5	4	0.235 (0.103)
Ashland	2005	Western Milksnake	*Lampropeltis gentilis*	S2	1	0.059 (0.057)
Ashland	2005	Gophersnake	*Pituophis catenifer*	S5	2	0.118 (0.078)
Ashland	2005	Prairie Rattlesnake	*Crotalus viridis*	S4	4	0.235 (0.103)
Ashland	2008				3	0.136 (0.073)
Ashland	2008	Western Tiger Salamander	*Ambystoma mavortium*	S4	1	0.045 (0.044)
Ashland	2008	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	10	0.455 (0.106)
Ashland	2008	Boreal Chorus Frog	*Pseudacris maculata*	S4	1	0.045 (0.044)
Ashland	2008	Plains Spadefoot	*Spea bombifrons*	S3	1	0.045 (0.044)
Ashland	2008	Common Sagebrush Lizard	*Sceloporus graciosus*	S4	14	0.636 (0.103)
Ashland	2008	North American Racer	*Coluber constrictor*	S5	8	0.364 (0.103)
Ashland	2008	Western Milksnake	*Lampropeltis gentilis*	S2	1	0.045 (0.044)
Ashland	2008	Gophersnake	*Pituophis catenifer*	S5	1	0.045 (0.044)
Ashland	2008	Terrestrial Gartersnake	*Thamnophis elegans*	S5	1	0.045 (0.044)
Ashland	2008	Prairie Rattlesnake	*Crotalus viridis*	S4	9	0.409 (0.105)
Ashland	2009				1	1 (0)
Ashland	2010				21	0.512 (0.078)
Ashland	2010	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	1	0.024 (0.024)
Ashland	2010	Common Sagebrush Lizard	*Sceloporus graciosus*	S4	16	0.39 (0.076)
Ashland	2010	North American Racer	*Coluber constrictor*	S5	2	0.049 (0.034)
Ashland	2010	Gophersnake	*Pituophis catenifer*	S5	2	0.049 (0.034)
Ashland	2010	Prairie Rattlesnake	*Crotalus viridis*	S4	5	0.122 (0.051)

Table 5. Species detected incidentally (178), and numbers of unique spatial observations (2,056), across all units and years of survey. The table is sorted first by Montana Species of Concern (SOC) and Potential Species of Concern (PSOC), then on numbers of observations, and then taxonomically. See Appendix A for Montana status and state rank definitions.

Montana Status	Common Name	Scientific Name	State Rank	Number of Observations
SOC	Red-headed Woodpecker	*Melanerpes erythrocephalus*	S3B	29
SOC	Brewer's Sparrow	*Spizella breweri*	S3B	27
SOC	Clark's Nutcracker	*Nucifraga columbiana*	S3	10
SOC	Great Plains Toad	*Anaxyrus cognatus*	S2	8
SOC	Northern Leopard Frog	*Lithobates pipiens*	S1,S4	8
SOC	Plains Hog-nosed Snake	*Heterodon nasicus*	S2	8
SOC	Plains Spadefoot	*Spea bombifrons*	S3	6
SOC	Sharp-tailed Grouse	*Tympanuchus phasianellus*	S1,S4	3
SOC	Snapping Turtle	*Chelydra serpentina*	S3	3
SOC	Western Milksnake	*Lampropeltis gentilis*	S2	3
SOC	Golden Eagle	*Aquila chrysaetos*	S3	2
SOC	Great Blue Heron	*Ardea herodias*	S3	1
SOC	Pinyon Jay	*Gymnorhinus cyanocephalus*	S3	1
SOC	Green-tailed Towhee	*Pipilo chlorurus*	S3B	1
SOC	Pallid Bat	*Antrozous pallidus*	S3	1
SOC	Greater Short-horned Lizard	*Phrynosoma hernandesi*	S3	1
PSOC	Common Poorwill	*Phalaenoptilus nuttallii*	S4B	4
PSOC	Plumbeous Vireo	*Vireo plumbeus*	S3S4B	4
PSOC	Ovenbird	*Seiurus aurocapilla*	S4B	3
PSOC	Porcupine	*Erethizon dorsatum*	S4	2
PSOC	Eastern Bluebird	*Sialia sialis*	S4B	1
	American Robin	*Turdus migratorius*	S5B	110
	Western Meadowlark	*Sturnella neglecta*	S5B	95
	Northern Pocket Gopher	*Thomomys talpoides*	S5	86
	Red-winged Blackbird	*Agelaius phoeniceus*	S5B	74
	Spotted Towhee	*Pipilo maculatus*	S5B	65
	Northern Flicker	*Colaptes auratus*	S5	59
	Boreal Chorus Frog	*Pseudacris maculata*	S4	58
	Woodhouse's Toad	*Anaxyrus woodhousii*	S4	57
	Mourning Dove	*Zenaida macroura*	S5B	57
	North American Racer	*Coluber constrictor*	S5	51
	Eastern Kingbird	*Tyrannus tyrannus*	S5B	48
	House Wren	*Troglodytes aedon*	S5B	37
	Yellow Warbler	*Setophaga petechia*	S5B	34
	Black-capped Chickadee	*Poecile atricapillus*	S5	32
	Red-tailed Hawk	*Buteo jamaicensis*	S5B	28
	Dark-eyed Junco	*Junco hyemalis*	S5B	27
	Red Crossbill	*Loxia curvirostra*	S5	26
	Pine Siskin	*Spinus pinus*	S5	26
	Quick Gloss	*Zonitoides arboreus*	S5	26
	Chipping Sparrow	*Spizella passerina*	S5B	24
	American Goldfinch	*Spinus tristis*	S5B	24
	Gophersnake	*Pituophis catenifer*	S5	24

Montana Status	Common Name	Scientific Name	State Rank	Number of Observations
	Turkey Vulture	*Cathartes aura*	S4B	23
	Killdeer	*Charadrius vociferus*	S5B	23
	Western Wood-pewee	*Contopus sordidulus*	S5B	23
	Yellow-rumped Warbler	*Setophaga coronata*	S5B	22
	Rock Wren	*Salpinctes obsoletus*	S5B	21
	Brewer's Blackbird	*Euphagus cyanocephalus*	S5B	21
	Red-breasted Nuthatch	*Sitta canadensis*	S5	19
	Field Sparrow	*Spizella pusilla*	S4B	19
	Painted Turtle	*Chrysemys picta*	S4	19
	Eight-spotted Skimmer	*Libellula forensis*	S5	19
	Mallard	*Anas platyrhynchos*	S5	18
	Multirib Vallonia	*Vallonia gracilicosta*	S4S5	17
	Western Glass-snail	*Vitrina pellucida*	S5	17
	American Kestrel	*Falco sparverius*	S5	16
	Common Nighthawk	*Chordeiles minor*	S5B	16
	Vesper Sparrow	*Pooecetes gramineus*	S5B	16
	Lark Sparrow	*Chondestes grammacus*	S5B	16
	White-crowned Sparrow	*Zonotrichia leucophrys*	S5B	15
	Terrestrial Gartersnake	*Thamnophis elegans*	S5	15
	Horned Lark	*Eremophila alpestris*	S5	14
	Mountain Bluebird	*Sialia currucoides*	S5B	14
	Savannah Sparrow	*Passerculus sandwichensis*	S5B	13
	Common Whitetail	*Plathemis lydia*	S5	12
	Brown Hive	*Euconulus fulvus*	S5	12
	Black-billed Magpie	*Pica hudsonia*	S5	11
	Least Chipmunk	*Tamias minimus*	S4	11
	Muskrat	*Ondatra zibethicus*	S5	11
	Northern Scorpion	*Paruroctonus boreus*	SNR	11
	Common Raven	*Corvus corax*	S5	10
	Gray Catbird	*Dumetella carolinensis*	S5B	10
	Cedar Waxwing	*Bombycilla cedrorum*	S5B	10
	Red Squirrel	*Tamiasciurus hudsonicus*	S5	10
	Great Horned Owl	*Bubo virginianus*	S5	9
	White-throated Swift	*Aeronautes saxatalis*	S5B	9
	Ruby-crowned Kinglet	*Regulus calendula*	S5B	9
	Western Tanager	*Piranga ludoviciana*	S5B	9
	Brown-headed Cowbird	*Molothrus ater*	S5B	9
	Coyote	*Canis latrans*	S5	9
	Black Bear	*Ursus americanus*	S5	9
	Mule Deer	*Odocoileus hemionus*	S5	9
	Sora	*Porzana carolina*	S5B	8
	Tree Swallow	*Tachycineta bicolor*	S5B	8
	Cliff Swallow	*Petrochelidon pyrrhonota*	S5B	8
	Common Yellowthroat	*Geothlypis trichas*	S5B	8
	Say's Phoebe	*Sayornis saya*	S5B	7
	Violet-green Swallow	*Tachycineta thalassina*	S5B	7
	American Crow	*Corvus brachyrhynchos*	S5B	7

Montana Status	Common Name	Scientific Name	State Rank	Number of Observations
	Warbling Vireo	*Vireo gilvus*	S5B	7
	Yellow-breasted Chat	*Icteria virens*	S5B	7
	Prairie Rattlesnake	*Crotalus viridis*	S4	7
	Columbia Spotted Frog	*Rana luteiventris*	S4	6
	Western Kingbird	*Tyrannus verticalis*	S5B	6
	White-breasted Nuthatch	*Sitta carolinensis*	S4	6
	Grasshopper Sparrow	*Ammodramus savannarum*	S4B	6
	Raccoon	*Procyon lotor*	S5	6
	White-tailed Deer	*Odocoileus virginianus*	S5	6
	Forest Disc	*Discus whitneyi*	S5	6
	Blue-winged Teal	*Anas discors*	S5B	5
	Barn Swallow	*Hirundo rustica*	S5B	5
	Common Green Darner	*Anax junius*	S4S5	5
	Dot-tailed Whiteface	*Leucorrhinia intacta*	S5	5
	Western Tiger Salamander	*Ambystoma mavortium*	S4	4
	Northern Harrier	*Circus cyaneus*	S4B	4
	Bullock's Oriole	*Icterus bullockii*	S5B	4
	Fathead Minnow	*Pimephales promelas*	S4S5	4
	Yellow-bellied Marmot	*Marmota flaviventris*	S4	4
	Meadow Slug	*Deroceras laeve*	S4	4
	Rocky Mountainsnail	*Oreohelix strigosa*	S5	4
	Tadpole Physa	*Physella gyrina*	SNR	4
	Merlin	*Falco columbarius*	S4	3
	Prairie Falcon	*Falco mexicanus*	S4	3
	Upland Sandpiper	*Bartramia longicauda*	S4B	3
	Hairy Woodpecker	*Picoides villosus*	S5	3
	Mountain Chickadee	*Poecile gambeli*	S5	3
	Townsend's Solitaire	*Myadestes townsendi*	S5	3
	Hermit Thrush	*Catharus guttatus*	S5B	3
	Brown Thrasher	*Toxostoma rufum*	S5B	3
	Black-headed Grosbeak	*Pheucticus melanocephalus*	S5B	3
	Lazuli Bunting	*Passerina amoena*	S4B	3
	Goldeye	*Hiodon alosoides*	S5	3
	Desert Cottontail	*Sylvilagus audubonii*	S4	3
	Elk	*Cervus canadensis*	S5	3
	Pronghorn	*Antilocapra americana*	S5	3
	Downy Woodpecker	*Picoides pubescens*	S5	2
	Cordilleran Flycatcher	*Empidonax occidentalis*	S4B	2
	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S5B	2
	Canyon Wren	*Catherpes mexicanus*	S4	2
	Song Sparrow	*Melospiza melodia*	S5B	2
	Long-eared Myotis	*Myotis evotis*	S4	2
	Big Brown Bat	*Eptesicus fuscus*	S4	2
	Thirteen-lined Ground Squirrel	*Ictidomys tridecemlineatus*	S4	2
	Beaver	*Castor canadensis*	S5	2
	Striped Skunk	*Mephitis mephitis*	S5	2
	Northern Rubber Boa	*Charina bottae*	S4	2

Montana Status	Common Name	Scientific Name	State Rank	Number of Observations
	Striped Meadowhawk	*Sympetrum pallipes*	S5	2
	Western Red Damsel	*Amphiagrion abbreviatum*	S4S5	2
	Marsh Pondsnail	*Stagnicola elodes*	SNR	2
	American Bullfrog	*Lithobates catesbeianus*	SNA	1
	Northern Shoveler	*Anas clypeata*	S5B	1
	Eurasian Wigeon	*Anas penelope*	SNA	1
	Gray Partridge	*Perdix perdix*	SNA	1
	Ring-necked Pheasant	*Phasianus colchicus*	SNA	1
	Dusky Grouse	*Dendragapus obscurus*	S4	1
	American Coot	*Fulica americana*	S5B	1
	Wilson's Snipe	*Gallinago delicata*	S5	1
	Rock Pigeon	*Columba livia*	SNA	1
	Northern Saw-whet Owl	*Aegolius acadicus*	S4	1
	Dusky Flycatcher	*Empidonax oberholseri*	S5B	1
	Gray Flycatcher	*Empidonax wrightii*	S4B	1
	Bank Swallow	*Riparia riparia*	S5B	1
	Red-eyed Vireo	*Vireo olivaceus*	S4B	1
	Yellow-rumped Warbler (Audubon's)	*Setophaga coronata auduboni*	S5B	1
	House Finch	*Haemorhous mexicanus*	S5	1
	Black Bullhead	*Ameiurus melas*	SNA	1
	Green Sunfish	*Lepomis cyanellus*	SNA	1
	Bluegill	*Lepomis macrochirus*	SNA	1
	Western Small-footed Myotis	*Myotis ciliolabrum*	S4	1
	Mountain Cottontail	*Sylvilagus nuttallii*	S4	1
	Bushy-tailed Woodrat	*Neotoma cinerea*	S5	1
	Common Sagebrush Lizard	*Sceloporus graciosus*	S4	1
	Western Tiger Swallowtail	*Papilio rutulus*	S5	1
	Monarch	*Danaus plexippus*	S4B	1
	Paddle-tailed Darner	*Aeshna palmata*	S5	1
	Twelve-spotted Skimmer	*Libellula pulchella*	S5	1
	Variegated Meadowhawk	*Sympetrum corruptum*	S5	1
	Eastern Forktail	*Ischnura verticalis*	S4S5	1
	Variable Vertigo	*Vertigo gouldii*	SNR	1
	Silky Vallonia	*Vallonia cyclophorella*	SNR	1
	Lovely Vallonia	*Vallonia pulchella*	SNR	1
	Dusky Arion	*Arion subfuscus*	SNA	1
	Blue Glass	*Nesovitrea binneyana*	S5	1
	Subalpine Mountainsnail	*Oreohelix subrudis*	S5	1
	Wrinkled Marshsnail	*Stagnicola caperata*	SNR	1
	Pewter Physa	*Physella acuta*	SNR	1
	Ash Gyro	*Gyraulus parvus*	SNR	1

APPENDIX A.

HERITAGE PROGRAM RANKS:

DEFINITIONS FOR GLOBAL AND STATE CONSERVATION STATUS RANKS AND MONTANA SPECIES OF CONCERN AND POTENTIAL SPECIES OF CONCERN

Heritage Program Ranks

The international network of Natural Heritage Programs employs a standardized ranking system to denote global (range-wide) and state status. Species are assigned numeric ranks ranging from 1 to 5, reflecting the relative degree to which they are “at-risk”. Rank definitions are given below. A number of factors are considered in assigning ranks — the number, size and distribution of known “occurrences” or populations, population trends (if known), habitat sensitivity, and threat. Factors in a species’ life history that make it especially vulnerable are also considered (e.g., dependence on a specific pollinator).

GLOBAL RANK DEFINITIONS (NatureServe 2003)

G1	Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction
G2	Imperiled because of rarity and/or other factors making it vulnerable to extinction
G3	Vulnerable because of rarity or restricted range and/or other factors, even though it maybe abundant at some of its locations
G4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery
G5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery
T1-5	Infraspecific Taxon (trinomial) —The status of infraspecific taxa (subspecies or varieties) are indicated by a “T-rank” following the species’ global rank

STATE RANK DEFINITIONS

S1	At high risk because of extremely limited and potentially declining numbers, extent and/or habitat, making it highly vulnerable to extirpation in the state
S2	At risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to extirpation in the state
S3	Potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas
S4	Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern
S5	Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range

COMBINATION RANKS

G#G# or S#S#	Range Rank—A numeric range rank (e.g., G2G3) used to indicate uncertainty about the exact status of a taxon

QUALIFIERS

NR	Not ranked
Q	**Questionable taxonomy that may reduce conservation priority**—Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank
X	**Presumed Extinct**—Species believed to be extinct throughout its range. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered
H	**Possibly Extinct**—Species known from only historical occurrences, but may never-the less still be extant; further searching needed
U	**Unrankable**—Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends
HYB	**Hybrid**—Entity not ranked because it represents an interspecific hybrid and not a species
?	**Inexact Numeric Rank**—Denotes inexact numeric rank
C	**Captive or Cultivated Only**—Species at present is extant only in captivity or cultivation, or as a reintroduced population not yet established
A	**Accidental**—Species is accidental or casual in Montana, in other words, infrequent and outside usual range. Includes species (usually birds or butterflies) recorded once or only a few times at a location. A few of these species may have bred on the one or two occasions they were recorded
Z	**Zero Occurrences**—Species is present but lacking practical conservation concern in Montana because there are no definable occurrences, although the taxon is native and appears regularly in Montana
P	**Potential**—Potential that species occurs in Montana but no extant or historic occurrences are accepted
R	**Reported**—Species reported in Montana but without a basis for either accepting or rejecting the report, or the report not yet reviewed locally. Some of these are very recent discoveries for which the program has not yet received first-hand information; others are old, obscure reports

SYN	**Synonym**—Species reported as occurring in Montana, but the Montana Natural Heritage Program does not recognize the taxon; therefore the species is not assigned a rank
*	A rank has been assigned and is under review. Contact the Montana Natural Heritage Program for assigned rank
B	**Breeding**—Rank refers to the breeding population of the species in Montana
N	**Nonbreeding**—Rank refers to the non-breeding population of the species in Montana

MONTANA ANIMAL SPECIES OF CONCERN

Montana Animal Species of Concern are native Montana animals that are considered to be "at risk" due to declining population trends, threats to their habitats, and/or restricted distribution. Montana Species of Concern are defined as vertebrate animals with a state rank of S1, S2, or S3. Because documentation for invertebrates is typically less complete than for vertebrates, only those ranked S1 or S2 are included as SOC. Invertebrates with a range rank extending below S2 (e.g., S2S3) are included as SOC only if their global ranks are G2G3 or G3, or if experts agree their occurrence in Montana has been adequately documented.

MONTANA ANIMAL SPECIES OF POTENTIAL CONCERN

Montana Potential Animal Species of Concern are animals for which current, often limited, information suggests potential vulnerability or for which additional data are needed before an accurate status assessment can be made. Vertebrate species with a rank indicating uncertainty (SU), a "range rank" extending below the S3 cutoff (e.g., S3S4), or those ranked S4 for which there is limited baseline information on status are considered Potential Species of Concern. Invertebrates of concern with global ranks other than G1, G2, or G3 and with state ranks below S2 or range ranks extending below S2 (e.g., S3S4) are treated as Potential Species of Concern.

APPENDIX B.

DATA FORM FOR LENTIC BREEDING AMPHIBIAN AND AQUATIC REPTILE SURVEYS

Data Form for Lentic Breeding Amphibian and Aquatic Reptile Surveys

Locality Information

Date	Observer(s)	Owner	Site Detection: Aerial Photo Topo Map NWI Map Incidental	GPS EPE

Strata Number	HUC Number	Site Number	State	County	Map Name

Locality	T	R	S	Section Description

Map Elevation FT	Latitude (decimal degrees)	Longitude (decimal degrees)	Survey Type 0 1 2 3 4 5 6 7 8

Habitat Information

Begin Time	End Time	Total Person Minutes of Search	Camera and Photo Number(s)/Description(s)

Site Dry: Y N	Site Origin: Beaver Water Depressional Manmade Other______________	Support Reproduction? Y N	GIS Mapping 0 1 2 3 4 5 6 7

Habitat Type:	Lake/ Pond	Wetland/ Marsh	Bog/ Fen	Backwater/ Oxbow	Spring/ Seep	Active Beaver Pond	Inactive Beaver Pond	Site Multipooled	Ditch/ Puddle	Reservoir/ Stockpond	Well/ Tank

Weather: Clear Partly Cloudy Overcast Rain Snow	Wind: Calm Light Strong	Air Temp °C	Water Temp °C	Water pH

Color: Clear Stained	Turbidity: Clear Cloudy	Water Connectedness: Permanent Temporary Isolated	Water Permanence: Permanent Temporary	Max Depth: < 1 M 1-2 M >2 M	Percent of Site > 2 M 0 1-25 26-50 51-75 76-100

Site Length:	Site Width:	Percentage of Site Searched: 1-25 26-50 51-75 76-100	Percent of Site at < 50 cm Depth: 0 1-25 26-50 51-75 76-100	~ Emergent Veg Area (M^2)

Percent of Site with Emergent Veg: 0 1-25 26-50 51-75 76-100	Percent of Site with Larval Activity: 0 1-25 26-50 51-75 76-100	Rank Emergent Vegetation Species in Order of Abundance: Sedges___Grasses__Cattails___Rushes___Water Lily___Shrubs___Other_____

Primary Substrate of Shallows: Silt/Mud Sand Gravel Cobble Boulder/Bedrock	North Shoreline Characteristics: Shallows Present: Y N Emergent Veg Present: Y N	Distance (M) to Forest Edge:

Grazing Impact None Light Heavy Structure Heavy Structure and Water Heavy Water	Water Dammed/Diverted Y N	Timber Harvest in Area Y N	Mining Activity Y N

Other Human Impacts Or Modifications:	Fish Detected? Y N	Time at First Detection:	Fish Species If Identified:

Fish Spawning Habitat Present? Y N U	Inlet Width:	Inlet Depth:	Inlet Substrate	Outlet Width	Outlet Depth	Outlet Substrate

Species Information

Amphibian Species		Time at first detection	E L M J A	No. Egg Masses		5-20mm larvae	≤10 ≤100 ≤1000 ≤10K >10K
20-50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	>50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	Number Juveniles		Number Adults	
Tissue Number		Voucher Number		Breeding with Fish?	Y N	If breeding with fish is cover present?	Y N
Amphibian Species		Time at first detection	E L M J A	No. Egg Masses		5-20mm larvae	≤10 ≤100 ≤1000 ≤10K >10K
20-50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	>50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	Number Juveniles		Number Adults	
Tissue Number		Voucher Number		Breeding with Fish?	Y N	If breeding with fish is cover present?	Y N
Amphibian Species		Time at first detection	E L M J A	No. Egg Masses		5-20mm larvae	≤10 ≤100 ≤1000 ≤10K >10K
20-50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	>50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	Number Juveniles		Number Adults	
Tissue Number		Voucher Number		Breeding with Fish?	Y N	If breeding with fish is cover present?	Y N
Amphibian Species		Time at first detection	E L M J A	No. Egg Masses		5-20mm larvae	≤10 ≤100 ≤1000 ≤10K >10K
20-50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	>50mm larvae	≤10 ≤100 ≤1000 ≤10K >10K	Number Juveniles		Number Adults	
Tissue Number		Voucher Number		Breeding with Fish?	Y N	If breeding with fish is cover present?	Y N

Reptile Species		Time at first detection	E J A	Number Individuals		SVL in CM		Tissue Number		Voucher Number	
Reptile Species		Time at first detection	E J A	Number Individuals		SVL in CM		Tissue Number		Voucher Number	
Reptile Species		Time at first detection	E J A	Number Individuals		SVL in CM		Tissue Number		Voucher Number	
Reptile Species		Time at first detection	E J A	Number Individuals		SVL in CM		Tissue Number		Voucher Number	

Site Map For Lentic Breeding Amphibian and Aquatic Reptile Surveys

Grid Scale:

N↑

***** Indicate the following locations on the map: **T** = temperature, **G** = GPS reading, **C** = clinometer reading, and **P**→ = photo locations and directions of photos. Indicate area with emergent vegetation with cross-hatching and indicate a 2-meter depth contour with a dashed line.

Other Notes:

Compass Bearing	70°	90°	110°	130°	150°	170°	190°	210°
Inclination (degrees)								

Definitions of Variables on Lentic Breeding Amphibian Survey Data Sheet

Locality Information

Date: Use MM-DD-YY format (e.g. 5/12/00 for May 12 of 2000).

Observers: List names or initials of individuals involved with survey of this site and circle the name of the recorder.

Owner: Use abbreviation of the government agency responsible for managing the land you surveyed. (e.g. USFS, BLM). If private land was surveyed list the owner's full name to indicate that you did not trespass.

Site Detection: Was site detected on aerial photo, topographic map, NWI map, or was it observed incidentally while in the field.

GPS EPE: The estimated positional error reported by the GPS receiver in meters.

Strata Number: The sample strata in which the 6th level HUC watershed lies (one of nine defined in western Montana).

HUC Number: The sample number of the 6th level HUC in one of the nine sample strata defined for western Montana.

Site Number: The number pre-assigned to the water body within each 6th level HUC. If the water body was not pre-assigned a number because it was not on topographic maps or aerial photos then assign it a sequential number and draw it on the topo map.

State: Use the two-letter abbreviation.

County: Use the full county name.

Map Name: List the name of the USGS 7.5-minute (1:24,000 scale) topographic quadrangle map.

Locality: Describe the specific geographic location of the site so that the type of site is described and the straight-line air distance from one or more permanent features on a 7.5-minute (1:24,000 scale) topographic map records the position of the site (e.g., Beaver pond, 1.5 miles south of Elephant Peak and 1.3 miles east of Engle Peak).

T: Record the Township number and whether it is north or south.

R: Record the Range number and whether it is east or west.

S: Record the Section number.

Section Description: Describe the location of the site at the ¼ of ¼ section level (e.g., SENE indicates SE corner of NE corner).

Map Elevation: The elevation of the site as indicated by the topographic map in feet (avoid using elevations from a GPS)

Latitude (decimal degrees): Decimal degrees of latitude of the stop as recorded on a GPS unit in WGS84.

Longitude (decimal degrees): Decimal degrees of longitude of the stop as recorded on a GPS unit in WGS84.

Survey Type: Circle the appropriate number defined as follows: 0 = private land so site was not surveyed; 1 = site not surveyed due to logistics; 2 = site is a lotic spring/seep not worth future survey; 3 = lentic site that is worth future survey; 4 = misidentified as a potential lentic site on the aerial photograph or on the topographic map (e.g., a shadow from a tree or a talus slope) and not worth future survey; 5 = inactive beaver dam that now only has lotic habitat and is not worth future survey; 6 = only lotic habitat is present and the site is not worth future survey, but it appears possible that the meadow was an historic beaver dam complex; 7 = a lentic site because it would hold water for at least a short time period during wetter conditions, but it is not worth future survey because it would never hold enough water long enough to support amphibian reproduction; 8 = site is not worth future survey for some reason other than those listed above.

Habitat Information

Begin Time: List the time the survey began in 24-hour format.

End Time: List the time the survey ended in 24-hour format.

Total Person Minutes of Search: Record the total person minutes the site was searched (e.g. if one person surveys for 15 minutes and another surveys for 30 minutes, but takes 5 minutes to measure a specimen the total person minutes is 40 minutes).

Camera and Photo Number(s) / Description (s): Identify the camera and the number of the photo as viewed on the camera's view screen and a description of the contents of the photograph (e.g., 13 = 1 x ASMO larvae and 14 = 1 x habitat). Take photos of all portions of the site and anything else that may be of interest (e.g., areas with fish versus areas with amphibians).

Site Dry: Circle whether the site was dry or not at the time of the survey.

Site Origin: Circle whether the site origin is glacial, beaver, water (i.e., flooding or spring), depressional, manmade, or describe other origin.

Support Reproduction: Is site capable of supporting reproduction so it is worth resurveying (e.g. in wetter years if now dry)?

GIS Mapping: Circle the appropriate number defined as follows: 0 = site not surveyed; 1 = a 4 in the survey type and site is not worth future survey; 2 = a 2, 5, 6, or 8 in survey type and site is not worth future survey; 3 = 7 in survey type and site is not worth future survey; 4 = a 3 in the survey type and site is dry, but is worth future survey; 5 = a 3 in the survey type and site has ephemeral water and is worth future survey (including high elevation sites that freeze solid); 6 = a 3 in the survey type, site is worth future survey, has emergent vegetation, and has permanent water that lasts all summer long and does not freeze solid in the winter so that it is likely to support aquatic overwintering; 7 = a 3 in the survey type, site is worth future survey, does not have functional amounts of emergent vegetation, and has permanent water that lasts all summer long and does not freeze solid in the winter so that it is likely to support aquatic overwintering.

Habitat Type: Circle the appropriate habitat type of the site being surveyed. If site is multi-pooled water information does not need to be gathered for every pool, but you may wish to record this information on the map. If breeding activity is limited to one pool at a multi-pooled site water information should be recorded for this pool and this should be noted in the comments.

Weather: Circle weather condition during survey.

Wind: Circle wind condition during survey (> 20 mph winds should be classified as strong).

Air Temp: Record air temperature at chest height in the shade. Record temperature in Celsius. °C = (°F – 32)/1.8

Water Temp: Record water temperature where larvae or egg masses are observed or at 2 cm depth 1 meter from the margin of the water body. Record temperature in Celsius. °C = (°F – 32)/1.8

Water pH: Record water pH at the same location water temperature was recorded.

Color: Circle whether the water is clear or stained a tea or rust color from organic acids.

Turbidity: Circle whether water is clear or cloudy.

Water Connectedness: Circle if water body has permanent connection to flowing water (Permanent), is connected to flowing water for a temporary period each year (Temporary), or is never connected to flowing waters or other water bodies (Isolated).

Water Permanence: Circle whether the site contains water throughout the entire year (Permanent), or contains water for only a portion of the year (Temporary).
Max Depth: Circle the category corresponding to the maximum depth of the water body.
Percent of Site > 2 M: Circle the percentage of the site with water depth greater than 2 meters deep.
Site Length: The length of the longest dimension of the standing water body.
Site Width: The width of the second longest dimension of the standing water body.
Percentage of Site Searched: Circle the percentage of the site surveyed.
Percentage of the Site at ≤ 50 cm Depth: Circle the appropriate percentage.
Approximate Area with Emergent Veg (M^2): The approximate area of the site that contains emergent vegetation.
Percentage of Site with Emergent Veg: Circle the percentage of the entire site with emergent vegetation.
Percentage of Site with Larval Activity: Circle the percentage of the site where amphibian larvae were observed.
Rank Emergent Veg Species in Order of Abundance: Record the rank order of abundance in front of the 3 most prevalent emergent vegetation species. If the vegetation present is “other” indicate what it is.
Primary Substrate: Circle the substrate that covers the majority of the bottom of the site.
North Shoreline Characteristics: Circle whether shallows and emergent vegetation are present or absent on the north shoreline.
Distance (M) to Forest Edge: Record the closest distance between the water’s edge and the forest margin in meters.
Grazing Impact: Circle the appropriate grazing category defined as follows: no grazing in vicinity of the site; grazing noted in the vicinity of the site, but no major impacts to wetland structure or water quality; heavy structural impacts to site (e.g.,vegetation destroyed creating bare ground, hummocks, pugging, or altered hydroregime); heavy structural impacts and water quality impacted due to animal waste; and water quality impacted due to animal waste.
Water Dammed/Diverted: Circle whether or not water has been dammed or diverted at the site (including blow outs or pits).
Timber Harvest: Circle whether or not timber has been harvested within 200 meters of the site.
Mining Activity: Circle whether or not there is evidence of mining activity within 200 meters of the site.
Other Human Impacts or Modifications: Briefly describe if, how, and when the site has been altered by human activities. If the site has not been altered record none for not altered. If multiple anthropogenic impacts exist document all of these using the back of the data sheet if necessary and qualify approximate timing of impact (e.g., recent versus historic).
Fish Detected?: Circle whether or not fish were detected.
Time at First Detection: If fish were detected, indicate the time in total person minutes of survey when they were first detected.
Fish Species if Identified: List the fish species identified.
Fish Spawning Habitat Present?: Are shallow waters with adequate gravels/cobbles present that would allow salmonid fishes to spawn? An active search for fry is also a good idea.
Inlet Width: What is the average width of the inlet stream in meters?
Inlet Depth: What is the average depth of the inlet stream in centimeters?
Inlet Substrate: What is the primary substrate at the inlet stream (Silt/Mud, Sand, Gravel, Cobble, or Boulder/Bedrock)?
Outlet Width: What is the average width of the outlet stream in meters?
Outlet Depth: What is the average depth of the outlet stream in centimeters?
Outlet Substrate: What is the primary substrate at the outlet stream (Silt/Mud, Sand, Gravel, Cobble, or Boulder/Bedrock)?

Species Information

For each species record the first two letters of the scientific genus and species names for all amphibian and reptile species found at the site (e.g., BUBO for *Bufo boreas*). Record the total number of person minutes of survey required before each life history stage of each species was encountered beside the E (egg), L (larvae), M (metamorph), J (juvenile), or A (adult). Record the number or category of number of each of the specified life history and/or size classes. For amphibians indicate whether they have bred in the same water body where fish are present, and if they have, indicate whether there is protective cover (e.g., extensive shallows with emergent vegetation, a log barrier, talus). Record the tissue number or range of tissue numbers for tissue samples collected (see tissue collection protocols). If the animal was swabbed in preparation for testing the animal for chytrid infection indicate the chytrid sample number in the Tissue Number field. Record the preliminary museum voucher specimen number for voucher specimens collected (see voucher specimen collection protocols).

Site Map for Lentic Breeding Amphibian and Aquatic Reptile Surveys

General: Include a rough sketch of the site including the shape of the site and the shape and spatial relations of surrounding biotic and abiotic features. Indicate the area covered with emergent vegetation with cross-hatching. Indicate a 2-meter depth contour for the water body with a dashed line. Indicate the location where the water temperature was taken, the location where the GPS position was taken, the location where clinometer readings for southern exposure were taken, and the location of any photographs with an arrow indicating the direction in which the photo(s) were taken. Make sure that the orientation of the sketch (i.e. the north arrow) corresponds to the orientation of the site.
Grid Scale: Indicate the approximate scale of the grid lines relative to the site sketched in meters.
Other Notes: Include any other notes of interest in this space. Examples: (1) areas of highest larval density; (2) thoughts on why a species may not have been detected at a site; (3) problems associated with the survey of the site (e.g., dangerous boggy conditions); (4) If a site was dry would it support reproduction during wetter years.
Southern Exposure: From a site on along the northern shoreline that would most likely to be used as an oviposition or larval rearing area (e.g., shallow waters with emergent vegetation in the NW corner of the water body) record the degree inclination from your position to the skyline (e.g., mountain or solid tree line) at each of the eight compass bearings listed. Note that the compass bearings are true north so you will need to adjust your compass according to the map being used to correct for the deviation from magnetic north (15 to 19.5 degrees in western Montana).

APPENDIX C.

DATA FORM FOR

PASSIVE NOCTURAL AMPHIBIAN CALLING SURVEYS

Data Form for Passive Nocturnal Amphibian Calling Surveys

Observer(s) ________________________________ **Start Lat/Long (DD)**_____________________________ **End Lat/Long (DD)**______________________________

Summary Comments on Survey Route (record temperatures every half hour or 5 stops) ____

____

____

Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	
Date	**Time**	**Weather**	**Latitude (DD)**	**Detection**	**Species Number, Bearing, & Distance to Chorus** (e.g., 5 x ANWO at 230 degrees and 100 m)
			Longitude (DD)	Y / N	

Definitions of Variables on Passive Nocturnal Amphibian Calling Survey Data Sheet

General Instructions

Conduct passive nocturnal amphibian calling surveys for spring-breeding amphibians on nights after rainfall events in the spring between mid-May and mid-June when air temperatures are above 50 °F or 10 °C and wind and precipitation conditions are suitable for aurally detecting choruses of male amphibians at potential breeding sites. Select routes to ensure the safety of the surveyors and the ability of surveyors to detect calling amphibians (i.e., avoid routes with high traffic or loud rushing water). At each stop, surveyors should passively listen for choruses of male amphibians for a minimum of 5 minutes before proceeding to the next stop. When choruses are detected, estimate the bearing (use a compass) and distance of the chorus from the stop location. *Surveys targeting Northern Leopard Frogs (*Lithobates pipiens*) and Columbia Spotted Frogs (*Rana luteiventris*) may be of interest in mid-March. If these species are being targeted for detection, stop locations need to correspond to the margins of potential breeding sites since calls for these species are only audible over short distances even under the best of weather conditions. Carlos Davidson's "Frog and Toad Calls of the Rocky Mountains: Vanishing Voices" is an excellent resource for learning the breeding calls of Montana's amphibian species. Calls can also be found on the Montana Field Guide at fieldguide.mt.gov

Route Information

Observer(s): List full names of individuals involved with full night of passive calling survey for amphibians.
Start Lat/Long (DD): Decimal degrees of latitude and longitude that the amphibian calling survey route began at.
End Lat/Long (DD): Decimal degrees of latitude and longitude that the amphibian calling survey route ended at.
Summary Comments on Survey Route: General narrative of the route from beginning to end including highways/roads traveled and general cover types passed through and overview of land ownership on the route.

Stop Information

Date: Use MM-DD-YY format (e.g. 5/12/00 for May 12 of 2000).
Time: List the time the survey began in 24-hour format.
Weather: Include brief info on weather conditions (e.g., wind speed, precipitation, etc.). At least every five stops or one half our record the air temperature in Celsius. °C = (°F – 32)/1.8
Latitude (DD): Decimal degrees of latitude of the stop as recorded on a GPS unit in WGS84.
Longitude (DD): Decimal degrees of longitude of the stop as recorded on a GPS unit in WGS84.
Species Number, Bearing, and Distance: Record the first two letters of the scientific genus and species names for all amphibian and reptile species detected (e.g., ANWO for *Bufo woodhousii* or SPBO for *Spea bombifrons*). Determine the bearing to the breeding chorus using a compass that has a bearing sighting ring. Estimate the distance to the breeding chorus as best you can. Accurate estimates of distance can often be difficult for even experienced surveyors. It is recommended that inexperienced observers spend at least a portion of a survey night walking to a breeding chorus for each species they are newly detecting in order to get a good sense for how far breeding calls can be heard. If multiple breeding choruses of either the same or different species are detected at a stop, record the bearing and distance to each chorus. For example: 5 x ANWO @ 230 degrees and 100 meters, 10 x SPBO @ 180 degrees and 1,000 meters, 5 x PSMA @ 5 degrees and 10 meters.

Species Codes for Montana Amphibian Species with Detectable Breeding Calls

Western Toad	ANBO
Great Plains Toad	ANCO
Woodhouse's Toad	ANWO
Plains Spadefoot	SPBO
Boreal Chorus Frog	PSMA

Pacific Treefrog	PSRE
American Bullfrog (exotic)	LICA
Northern Leopard Frog*	LIPI
Columbia Spotted Frog*	RALU

*Species with breeding calls that are only audible over short distances.

APPENDIX D.

DATA FORM FOR

ROCK OUTCROP SURVEYS FOR REPTILES

Data Form for Rock Outcrop Surveys for Reptiles

Locality Information

DM Region SE MONTANA	QQUAD	Site No:	Locality:

State:	County:	Map Name:	T	R	S	Section Description:

Owner:	Map Elevation: FT	Datum	Latitude (decimal degrees)	Longitude (decimal degrees)

Habitat Information

Date:	Observer(s):	Begin Time:	End Time:	Total Person Minutes of Search:	Area (M^2) Searched:

Percentage of Site Searched: 1-25 26-50 51-75 76-100	Percent Slope:	Aspect: N NE NW S SE SW E W Flat

Habitat Cover Type As Percent of Site Surveyed:

Cliff/Outcrop	Bluff/Coulee Rim	Talus	Open Conifer Forest	Open Mixed Forest	Shrub/Steppe	Grassland	Other_____________
__________%	____________%	____%	______________%	_____________%	________%	______%	__________%

Site Overview Photo Taken ☐ Photo Description(s)	Air Temp: °C	Soil Temp: °C

Weather: Clear Partly Cloudy Overcast Rain Snow	Wind: Calm Light Strong	Potential Hibernaculum Y N

Soil Moisture: Dry Damp Wet Standing Water Snow	Dominant Substrate Type: Bedrock Compressed Soil Sand Detritus Gravel (<4 cm diameter) Cobble (4-30cm diameter) Boulder (>30 cm diameter)

Habitat Description/Threats:

Reptile Species Information

Species:	Number and Time at First Detection (e.g., 2 x juveniles, 25 cm TL @ 10 minutes)	Cover Type at Animal's Location:
Tissue Number (e.g., MTHP5533)	Substrate Association of Animal (Circle): under wood on/under 4-20cm rock fragments on/under >20cm rock fragments in vegetation on leaf litter in rock fracture Other ______________	
Voucher Number & Description:		

Species:	Number and Time at First Detection (e.g., 2 x juveniles, 25 cm TL @ 10 minutes)	Cover Type at Animal's Location:
Tissue Number (e.g., MTHP5533)	Substrate Association of Animal (Circle): under wood on/under 4-20cm rock fragments on/under >20cm rock fragments in vegetation on leaf litter in rock fracture Other ______________	
Voucher Number & Description:		

Species:	Number and Time at First Detection (e.g., 2 x juveniles, 25 cm TL @ 10 minutes)	Cover Type at Animal's Location:
Tissue Number (e.g., MTHP5533)	Substrate Association of Animal (Circle): under wood on/under 4-20cm rock fragments on/under >20cm rock fragments in vegetation on leaf litter in rock fracture Other ______________	
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Site Map for Reptile Site Surveys

Grid Scale:

N↑

***** Draw a rough sketch of the site labeling major features such as cliffs, talus slopes, and all habitat cover types. Be sure to indicate where animals were detected and label the following locations on the map: **G** = GPS reading, - - - - - - = area surveyed, and **P**→ = photo locations and directions of photos.

Other Notes:

Detection Summary (list surveyors in left column and species detections in others (e.g., 1 @ 5 min)

Surveyor						

Definitions of Variables on Reptile Site Survey Form

Site Information

Strata Number: The sample strata in which the 6th level HUC watershed lies.
HUC Number: The sample number of the 6th level HUC.
Site No: Identify three digit number of the site being surveyed within each sampling block (range 001-999).
Locality: Describe the specific geographic location of the site so that the type of site is described and the straight-line air distance from one or more permanent features on a 7.5-minute (1:24,000 scale) topographic map records the position of the site (e.g., Large talus slope 1.5 miles north of Engle Peak, N side of FS Road 225).
State: Use the two-letter abbreviation.
County: Use the full county name.
Map Name: List the name of the USGS 7.5-minute (1:24,000 scale) topographic quadrangle map.
T: Record the Township number and whether it is north or south.
R: Record the Range number and whether it is east or west.
S: Record the Section number
Section Description: Describe location of the site at the ¼ of ¼ section level (e.g., SENE indicates SE corner of NE corner).
Owner: Use abbreviation of the government agency responsible for managing the land you surveyed. (e.g. USFS, BLM). If private land was surveyed list the owner's full name to indicate that you did not trespass.
Map Elevation: The elevation of the site as indicated by the topographic map in feet (avoid using elevations from a GPS)
Datum: The map datum used, typically WGS84 if off GPS unit on standard setting.
Latitude (decimal degrees): Decimal degrees of latitude of the stop as recorded on a GPS unit in WGS84.
Longitude (decimal degrees): Decimal degrees of longitude of the stop as recorded on a GPS unit in WGS84.

Survey Information

Date: Use MM-DD-YY format (e.g. 05/12/00 for May 12 of 2000).
Observers: List names or initials of individuals involved with survey of this site and circle the name of the recorder.
Begin Time: List the time the survey began in 24-hour format.
End Time: List the time the survey ended in 24-hour format.
Total Person Minutes of Search: Record the total person minutes the site was searched (e.g. if one person surveys for 15 minutes and another surveys for 30 minutes, but takes 5 minutes to measure a specimen the total person minutes is 40 minutes).
Area (M^2) Searched: Area in square meters that was surveyed.
Percent of Site Searched: Circle the appropriate category.
Percent Slope: Percent slope of site. Enter range if variable.
Aspect: Circle primary aspect of the site.
Habitat Cover Type as Percent of Site Surveyed: Identify percent composition of each habitat type within site surveyed.
Photo Frame Number(s) / Descriptions: The number of the photo as viewed on the camera's view screen and a description of the contents of the photograph (e.g., #13 = 1 x Milksnake and #14-18 = 5 x habitat). Take photos of all portions of the site and anything else that may be of interest (e.g., reptile species, potential site threats).
Air Temp: Record air temperature in °C at chest height in the shade. °C = (°F – 32)/1.8
Soil Temp: Record soil temperature in °C at 10 cm depth. °C = (°F – 32)/1.8
Weather: Circle weather condition during survey.
Wind: Circle wind condition during survey (> 20 mph winds should be classified as strong).
Potential Hibernacula: Does the site contain suitable underground refugia (e.g., talus, caves) to support overwintering.
Soil Moisture: Circle the appropriate category.
Dominant Substrate Type: Circle the appropriate category.
Habitat Description/Threats: Note the most prominent characteristics of the site with relation to reptiles (e.g., could the site support overwintering). Also note habitat threats from grazing, logging, mining, flooding, road building, weeds, fire, etc.

Species Information

For each species record the first two letters of the scientific genus and species names for all amphibian and reptile species found at the site (e.g., COCO for *Coluber constrictor*). Record the total number of person minutes of survey required before each life history stage of each species was encountered and the size or size range of the animals encountered. Record the tissue number or range of tissue numbers for tissue samples collected (see tissue collection protocols. Record the preliminary museum voucher specimen number for voucher specimens collected (see voucher specimen collection protocols). Circle the substrate the animal was associated with at time of detection. Record the presence of other species detected at the site (e.g., millipedes), the time at first detection, and the voucher number and description of animals collected (see voucher and tissue collection protocols).